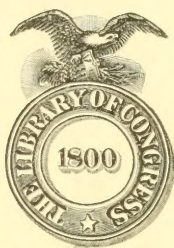


The
Farmers' Guide Book

*A Ready Reference Book of Useful Facts
and Rules for American Farming*

C. S. PALMER, B. L.



Class J501

Book P25

Copyright N^o _____

COPYRIGHT DEPOSIT.

The
Farmers' Guide Book

*A Ready Reference Book of Useful Facts
and Rules for American Farming*

By

C. S. PALMER, B. L.

Teacher and Practical Farmer

PRICE, ONE DOLLAR

THE HAMMOND PRESS
BUFFALO, NEW YORK

S501
P25

COPYRIGHTED 1915
By
THE HAMMOND PRESS
BUFFALO, N. Y.

\$1.00

FEB 25 1916

©CL.A420908

no. 1.

new 728'16.

PREFACE.

In compiling THE FARMERS' GUIDE BOOK the writer has had in mind the demands of many for a more condensed and convenient source of information than is afforded by the current agricultural works. The average farmer has little time and less inclination to read three or four pages for a fact that might better have been expressed in a single sentence. He wants his information boiled down, and free from technicalities or literary verbosity.

The book is designed, primarily, for two classes: 1. The beginners who are anxious to start right; 2. The average farmer who, not having had the advantages of an agricultural college training, wishes to avail himself of at least some of the information which those institutions teach.

The method of expression used by the writer has enabled him to convey, in one small book, information that would, ordinarily, occupy several volumes. The live topics of modern farming, such as "Fertilizers," "Lime," "Alfalfa," "The Orchard," "Rotation of Crops," "Cement," etc., have been fully and carefully treated. These chapters will not only be of inestimable value to the farmer, but they will be of great assistance to all teachers and students of agriculture.

The directory of firms, which is an important feature of the book, will be enlarged as later editions are published; and all firms whose dealings have been found questionable will be dropped. It is the purpose to make the list not only complete, but reliable. Integrity and square dealing are all that is required for a listing. Unreliable concerns will not, knowingly, be included for any consideration.

The writer hereby acknowledges his indebtedness to the many agricultural colleges and experiment stations who have so freely answered his questions; to the agricultural press, especially to *The Rural New Yorker*, from whose columns he has freely drawn; to Doctor L. S. Backus, of the State University of Missouri, who contributed most of the chapter on "Cow Troubles and Their Remedies;" to F. E. Beatty, of the firm of Kellogg & Co., strawberry growers, of Three Rivers, Michigan, for the chapter on strawberries; and to the A. I. Root Company, of Medina, Ohio, for the chapter on "Bees and Bee-keeping."

Criticisms and suggestions for future editions will be gratefully received.

C. S. PALMER.

“The nation is not fed by peace, or destroyed by war; these conditions only exercise a temporary influence on it. It is the soil, on which man builds his home, that is instrumental in holding humane society together, or dispersing it, and in causing nations and empires to disappear, or to become powerful.”—*Liebig*.

ADVANTAGES AND DISADVANTAGES OF FARM LIFE.

What are some of the advantages of farm life?

1. **INDEPENDENCE.**—The owner of a well stocked farm may well revel in his freedom from the cares and anxieties of the ordinary city man. He is his own boss and can take a day or a week off, at any time, without fear of losing his job. He has no rent to pay, taxes are low and the bill collector is only an occasional factor in his domain. Speaking on this subject, W. J. Spellman, of the U. S. Department of Agriculture, says:

“In the first place, the farmer, if he is at all successful, has no fear of being displaced. He commands his own time and leads an independent life. In the second place, if he is wise, he may himself produce nearly all the food necessary for his family. He may maintain a good garden, an orchard, a flock of poultry, keep a few cows and pigs, and grow most of his own bread. If the wife and daughters know how to prepare food in an appetizing manner and understand how to be frugal, the actual money expense for the farm living may be made very small, while at the same time the standard of living, from the standpoint of food, may be much higher than is possible even with wealthy people in the city.”

2. **BETTER HEALTH.**—Many a man, a physical wreck from too close application to work in an office or shop, has been restored to health and happiness by an active, out-door life on a farm. The pure water, fresh air and healthful surroundings are conducive to physical vigor, mental equipoise and a long life.

3. **A GOOD PLACE TO BRING UP CHILDREN.**—It has long been known that many, if not a majority, of our ablest and staunchest men, both in business and professional life, are from the ranks of those whose early years were spent upon the farm. Nature is an ideal teacher. If there are “books in the running brook,” there are still more in the meadow and the woods, and among the buds, the blossoms and the fruit.

There are fewer temptations in the country than in the city. There vice does not beckon on every hand, and one need not be ever on the alert for the preservation of life or limb. Nor are broadening and uplifting influences wanting. To be among domestic animals and to help care for their young, to possess and associate with pets are some of the factors which tend to develop the generous and humane instincts of the child.

What are the chief disadvantages of farm life?

1. **LACK OF A STEADY INCOME.**—While, no doubt, the city-bred man in the country will miss the usual pay envelope every Saturday night, it should be borne in mind that he already has his pay in the growing crops and stock that will later be ready for the

market. The writer has in mind a man who, being caught in the "back to the land" movement, purchased a farm and, for three years, worked it with the same energy and intelligence that he had displayed in the city office. But he missed the fixed and steady income, often being almost entirely without money; so, grasping an opportunity, he sold his farm at cost and advertised the personal property for sale at auction. On figuring up after the sale, he was surprised to find that he had a little more than \$3,000, cash profit, over and above what his equipment had cost. This set him to thinking; and having decided that he knew of no easier or quicker method to accumulate \$3,000 in so short a time, he cancelled his engagement in the city and immediately purchased another farm.

2. LACK OF CONVENIENCES.—This feature of country life has been and, to some extent, is now one of the serious objections to farming. The city wife, accustomed to her convenient bathroom, to the use of gas and electricity, her refrigerator and power washer, would find it hard to be reconciled to the conditions found on many farms. But a new order of things is on its way. The telephone and rural delivery have come, state roads are being made and the automobiles are annihilating distances. In this connection we quote from the Long Island *Agronomist*, the following:

"At the present day the home life in the country is growing easier and pleasanter for the women folk; while in the city it is growing bewilderingly complex, more crowded and more difficult to handle. In the country the door-yard is being spruced up. Rural delivery of mail has come. Carrying water in a pail is remarkable for its rarity; the hard-working pump has well nigh disappeared and water flows in the country house by gravity. Reliance on the kitchen wood-stove for heat as well as cooking is rapidly becoming a thing of the past. Hot air, steam and even hot water, heat many a farm-house. Pianos and pianolas have replaced the doleful melodeon, and the dining table of the country girl groans with good things; while on the city girl's table it's a miracle that the food does not do the groaning! Acetylene or gasoline gas has taken the place of oil lamps; and, often, the farm stream furnishes power for electric lights and other purposes."

Other disadvantages of farm life, depending more or less on location and local conditions, are: distance from physicians, schools and churches; uncongenial neighbors, tramps, lack of fire and police protection, etc. The back-to-the-lander should weigh well all these things. By thorough and careful investigation he can determine beforehand just about what the conditions will be; then his own judgment must decide whether it is best to make the change.

BUYING A FARM.

How may I find a farm for sale?

Watch the advertisements in the daily and farm papers, write to some of the dealers listed in this book, or advertise in some paper that covers the section in which you wish to locate. An advertisement of ten or fifteen words will bring you many replies.

How large a farm shall I buy?

This depends upon the purpose for which the farm is to be used. If for a truck farm, twenty acres will be large enough for a good start. If for a dairy farm, from one hundred fifty acres up will be needed. Gauge the size of the farm by your capital and what you wish to do.

Is it better to buy a run down farm at a low price and try to bring it up, or get one in a high state of cultivation and pay more?

This depends upon the farmers resources, not only in money, but in knowledge and ability. If a farmer has capital enough to live on for a couple of years without much income and will follow the rules laid down in this book, he may profitably start with a run down farm, provided he can get it at a correspondingly low price.

What cautions should be observed in buying a farm?

1. Always see a farm before you buy it. Several examinations during the summer, so that the land may be seen in different conditions of drouth and excessive moisture, may be profitably made. The amount of tillable land in the farm should be determined by actual measurement. Do not accept the estimates of the owner. Attention should be paid as to whether this land is stony, so that plowing is made difficult, whether it is hilly, so that many kinds of farm machinery cannot be used to advantage, whether the fields are convenient to the barn or are so broken up by ditches that it is impossible to work them to advantage.

2. If it is thought advisable to purchase, employ a reliable attorney to make the transaction for you, determining in advance the amount of his charges, which, in any case, should not exceed twenty-five dollars. He should see that the seller furnishes an abstract, showing a clear title, and a full warranty deed; also that there are no legal claims against the personal property. The deed should be recorded as soon as it is executed.

3. Do not purchase on terms that you can not meet, should your first year's crop prove a failure. Many a would-be-farmer has gone to the wall because his first crops were less profitable than he had expected and his expenses were correspondingly more. Drouths, crop failure and poor markets may always be expected and should be provided for.

4. If a man has only a small capital, say \$500 or \$1,000, he may start by renting a small farm near the city. With a little hired help he can work such a place and still retain his city job until he feels justified in giving the farm his entire attention. With poultry and vegetables, and by keeping a cow and a pig or two, many who have started in this way have been very successful.

How may the desirability of a farm be determined?

Have definitely in mind the purposes for which you wish to purchase the farm; then study its adaptability to these purposes, giving special attention to the following particulars:

1. *Soil.* Is it clay, sand, or gravel? Clay is good grass land and suitable for general farm crops. It is not, however, suitable for early cultivated crops, as it is too cold, too wet and too hard. It is also, more difficult and unsatisfactory to work than is any other soil, requiring just the proper treatment in order to avoid baking and hard lumps. The depth of the soil should be carefully determined. Many crops, of which alfalfa is one, cannot be raised profitably on shallow soil. If possible, have the farm bureau agent of that county go over the farm with you and advise you. He is paid by the county and will do this with no expense to you.

2. *Drainage.* Many farms are run at a loss because the soil is so wet in the spring that crops cannot be gotten in early enough for a profitable market. Practically all farm land could be improved by drainage and many farms must be drained to be made to pay. Go over the farm in a wet season and determine exactly its condition in this important particular.

3. *Water.* If a dairy farm is wanted, make sure that there is plenty of living water, convenient for both summer and winter. Dairying cannot be profitably carried on without this. Let the other man put down the expensive wells and install a pumping plant. You can find a farm that does not need them.

4. *Pasture.* If for dairying, look well to the pasture and the fences around it. Cows bought here and there of farmers are usually unruly and difficult to keep within bounds. As pastures usually run in New York State, about five acres are required to pasture one cow during the summer. Barbed wire, which makes the most popular and cheapest fence, costs about \$1.75 per spool of eighty rods. Three strands are required for a good fence. The posts, which should be placed not farther than one rod apart, will cost from six to ten cents each.

5. *Buildings.* Are the buildings ample and suitable for your purposes, or must you at once repair, remodel or build new? Many farm buildings have excellent frames above ground, but sills so rotten and walls so poor that they have to be repaired or the buildings will collapse. See that the floors are sound and whether, or not, the roofs need shingling. Farmers often wish to sell because their buildings

are just about to tumble down, and they are not able to repair them. Make careful study as to the arrangement and convenience of the buildings. The writer has now in mind a farm on which the buildings are so unhandy that it takes three men two hours to do chores that one man, with a more convenient arrangement, could easily do in half an hour. See the buildings, if possible, in wet weather. Is the drainage away, or is the barnyard a disagreeable mud hole?

6. *Well and Cellar.* Determine if there is good water in the well and if it ever goes dry. Has it ever been cleaned? Is the cellar under the house warm enough to protect vegetables from freezing in the winter? Are the cellar drains open? Do not let yourself be surprised into finding that you must immediately spend a hundred dollars, or more, on the cellar in order that it may be serviceable.

7. *Market and Roads.* Find where your markets are and go over the roads to them. If there are long, steep hills to climb, better try some other locality. Drawing heavy loads up steep hills is costly and dangerous, whether with horses or with trucks.

8. *Timber.* See if there is enough wood on the farm for fuel. A quantity of good, first-growth timber would be a valuable asset, as it would furnish lumber for building and repairs. Do not, however, be led to believe that "there is enough timber on the place to pay for it." Getting out and marketing lumber is a difficult and costly task and the returns are rarely what are expected. Unless there is a good local market, the owner cannot usually dispose of timber to any great advantage.

If I have only a part of the price and the owner, wants all cash, where can I borrow the remainder?

Writing on this subject in the *Rural New-Yorker*, E. S. Brigham says:

"The prospective purchaser will do well to visit the local banker; because bankers usually have a very fair and conservative idea of the value of farm property in the territory which they serve. Bankers are also interested in having the farms in their community fall into the hands of good respectable people who will make the best possible use of the land. If the purchaser needs to borrow money he will probably find it necessary to appeal to the local banker for a loan. The amount which a banker can loan on a farm is usually limited by the laws of the State. Bankers usually consider a farm mortgage as a very desirable security and a person who has a good moral character, a reputation for meeting his bills promptly and who can show a good purpose for using the money would probably have no trouble in borrowing 60% of the value of the farm. The interest may vary in different States under different conditions, but will probably be 6%. Payments should be made promptly, because only in this way can a farmer or any other person gain a reputation which will enable him to secure credit necessary for doing business. A poor man of whom it

can be said 'his word is as good as his bond' will be able to do business easily where a rich man of whom the opposite is true will be hampered."

What would be the equipment for a moderate-sized farm?

10 Cows	\$400
One thoroughbred bull	100
Two horses	350
Heavy harness	40
Light harness (single)	20
Heavy wagon	70
Light wagon	35
Plow	11
Mower	43
Cultivator	7
Grain drill	85
Reaper and binder	125
Spring harrow	15
Disk	23
Hay rake	20
Roller	20
Manure spreader	100
Weeder	8
Heavy bob sleds	25
Single buggy	35
Cutter	25
Milk cans and small tools	25
Twenty hens	16
Horse sprayer	60
Four pigs	20

How may the farmer get an outfit at a small price?

By buying at auctions. Although stock usually sells at auctions at the top figures, it has been the writer's experience that farming tools are usually struck off at a low price. In buying second-hand tools, however, always examine them first and make sure that they are not worn out and useless.

DON'TS.

Don't be in a hurry to buy.

Don't expect to get rich in one year, or two.

Don't forget that it takes a great deal of hard work to run a farm; that help is scarce and wages are high.

Don't think that the prices you are paying for vegetables at the corner grocery are what the farmer is receiving.

Don't get frightened if the owner of the farm tells you that others are after it and he must know your decision in a few days. He may have been saying this to prospective purchasers for the past ten years.

Don't take for granted everything that the neighbors may say. Talk with them, but remember they may have an ax to grind. Even the man on the farm may have been promised a good bonus, if the farm is sold while he is there.

Don't buy in a neighborhood where your family would be unhappy.

Don't think that some new development, such as a railroad, oil or gas will soon greatly enhance the value of the farm. If the owner believed this he would not want to sell.

Don't pay as much for a farm six miles from a railroad as you would for one only a mile away.

Don't run any risk of an imperfect title.

Don't let the real estate agent hurry you.

Don't fail to examine the inside of the house thoroughly; it may be full of vermin.

Don't fail to talk with the local banker.

Don't take too much risk.

DRAINAGE.

Is the subject of drainage important to the average farmer?

There is no more important subject for the farmer to consider. It is safe to say that three-fourths of all unprofitable farming is due to lack of drainage. This subject is only just beginning to receive the attention which its importance demands. Farmers are beginning to realize that, no matter what the expense, their land must be properly drained in order to yield satisfactory profits.

Mention some of the benefits resulting from drainage?

1. By removing the water it gives a greater depth for plants to feed.

2. It makes the soil mellower and tends to prevent baking and cracks.

3. Drainage helps to ventilate the soil. Air is absolutely necessary for roots and useful bacteria, but it cannot penetrate into soil that is full of water.

4. Contrary to general belief, drainage increases the amount of moisture available for crops. This is because the soil particles in drained land are finer; thus increasing capillary attraction.

5. Drainage makes the soil warmer. A test in the peat bogs of Lancashire, England, showed that at depth of 7 inches, the drained soil was 15° warmer than the undrained.

6. Drainage lessens erosion and heaving.

7. Drainage increases the available amount of plant food and promotes the growth of useful bacteria.

8. Drainage helps to keep the land from getting sour.

9. Drained soils yield much larger crops than undrained soils.

What lands are most in need of drainage?

1. Large, flat areas having clay subsoil.

2. Bogs and swamps where water stands most of the summer.

3. Lands that are too wet because of the overflow of streams.

4. Depressions in hillsides that hold water coming from above.

5. All land that is intermittently wet for two or three days at a time.

Mention some of the visible signs of too wet land.

1. Fruit trees missing, singly or in blocks.

2. Corn weak and patchy.

3. Heaving out of crops during the winter.

4. Grass supplanted by plantain in large, blotchy areas.
5. Hard soil and unsatisfactory crops.

What methods of drainage are used?

1. Boring holes, sinking wells, or blasting holes by the use of dynamite. These methods are applicable to fields where an impervious layer of hard clay, shale or rock, separates the top soil from a deep, porous layer beneath.

2. Surface ditches. This is the cheapest method. Ditches are effective, however, only to their own depth. They are unsightly and interfere with the general farm work.

3. Tile drainage. This is the modern and most effective method. A farm drained by this method is often increased in value more than two hundred per cent. Well drained farms can be worked earlier in the spring and crops are better and surer.

What rules should be observed in tile draining?

1. Do the work well, or not at all.
2. The main drain should occupy the lowest portion of the field. It should be larger than the lateral drains, if much water is to be carried away.
3. A fall of two feet in one thousand will be sufficient, if the tile is properly laid.
4. The bottoms of the ditches should be even and the tile laid very carefully with ends close together. Remember that one piece improperly laid may block up the entire line.
5. Care should be exercised not to displace the tile when covering.
6. The outlet of the main should be looked after with some care, that the water from it will not do damage in washing and that animals can not crawl into it. An ounce of prevention in this last particular will be worth many pounds of cure.

How deep should tile be laid?

"The depth of drains will range from about twenty inches to three and a half or four feet. The commonest depth is two to three feet. In sandy land the drains may be placed deeper than in clay land. Up to a depth of four feet an increase in the depth of the drain will permit an increase in the interval between drains of about two rods for each foot in depth. In clay land an increase in the depth of laying the tile will usually not permit an increase in the interval between the drains."—*Cornell Leaflet*.

How may ditches for tile draining be dug?

They may be dug with a pick and shovel; but by far the best and cheapest way is by the special machines that are made for this purpose. The cost of tile draining, when machines are used, will average not far from \$30 per acre.

How far apart should lines of tile be placed?

The distance apart and arrangement of the lines will, of course, depend upon the structure of the soil and the slope of the land. If in hard clay, they should be as close as four or five rods; while in very porous soil, seventy feet may be near enough.

How does the water get into the tile?

The water enters the tile through the joints from the bottom.

What kind of tile should be used?

Use the hard-burned 3, 4, or 5-inch tile, the size depending upon the amount of water to be removed.

DRAINAGE DON'TS.

Don't try to drain without some fall.

Don't use too small tile.

Don't join laterals to the main at right angles.

Don't forget that the more fall, the more water will be removed.

Don't forget that drainage does not remove any water that would be a benefit, if it remained.

Don't spoil your drain by knocking the tile apart when you cover them.

FERTILIZERS.

What is a fertilizer?

A fertilizer is anything that supplies plant food.

How are fertilizers classified?

Into natural fertilizers and artificial fertilizers.

What are natural fertilizers?

Natural fertilizers are those that have been derived from natural sources with no special treatment: as, stable and barnyard manure, ashes, leaves, etc.

What are artificial fertilizers?

Artificial fertilizers are those that have been prepared with a view of supplying some definite elements to the soil.

What necessary plant foods are supplied by artificial fertilizers?

Nitrogen, phosphorus and potash.

How may the amounts of available nitrogen, phosphorus and potash in a commercial fertilizer be determined?

The amounts are always stated on the labels on the bags.

Thus, "Available Nitrogen 2-5%" means 2% of nitrogen, and nothing more.

What is meant by a "2-7-12 fertilizer?"

One containing 2% of nitrogen, 7% of phosphoric acid and 12% of potash.

How may users of fertilizers in large quantities save on the cost?

By buying the ingredients and doing the mixing themselves.

Are home-mixed fertilizers as good as those purchased from the factories?

They are, notwithstanding reports to the contrary.

What substances are used to furnish the nitrogen in artificial fertilizers?

Nitrate of soda, ammonium sulfate, cottonseed meal, dried blood, dried fish, etc.

What is nitrate of soda?

Nitrate of soda is a chemical compound, found in great quantities in the dry, mountainous regions of Chili, and for this reason it is often called "Chili saltpeter." As purified for market, it contains about 16% nitrogen and costs about \$50 per ton. It is easily soluble and becomes at once available for plant use. On sandy, porous land it is easily lost by bleaching. It is the only artificial fertilizer that should be used as a top dressing.

What is ammonium sulfate?

Ammonium sulfate is a by-product of the manufacture of illuminating gas, coke and bone-black. It contains about 20% of nitrogen, but has a tendency to make the land sour and should always be used in connection with lime.

On what part of the plant does nitrogen have its principal effect?

On the leaves and stalks. Nitrogen gives the rich green color to foliage. Used in excess, it causes a too rank growth.

What is the source of the phosphorus of fertilizers?

Bones, phosphate rock and Thomas slag.

What is phosphate rock?

Phosphate rock, thought to be of marine animal origin, is found in many parts of the South, notably in South Carolina, Florida and Tennessee. The rock is dug out, ground very fine and sold under the name of "floats." In this form it is ready to apply without further treatment, but is only slowly available. When the ground rock is treated with sulphuric acid, it becomes much more quickly available as plant food. In this condition it is known as *acid phosphate*, or *super-phosphate*, and may contain from 14% to 20% of phosphoric acid.

What substances are used to furnish the potash for fertilizers?

Muriate of potash, sulfate of potash and kainit. The muriate contains 50% and the sulfate 48% of actual potash.

What is kainit?

Kainit is one of the potash salts from the great potash mines of Germany. It contains from 12% to 13% potash, but it is not so profitable to buy as the muriate or sulfate. It is said to destroy the white lice that prey upon the roots of some plants.

What is considered the cheapest potash fertilizer?

Muriate of potash. It is the best for most crops, although the sulfate gives the best results on tobacco.

What materials would be needed to equal ten tons of 2-8-10 fertilizer?

$20,000 \div .02 = 400$; $400 \div .16 = 2500$ pounds of sodium nitrate;

$20,000 \div .08 = 1600$; $1600 \div .14 = 11429$ pounds of acid phosphate;

$20,000 \div .10 = 2000$; $2000 \div .50 = 4000$ pounds of muriate of potash.

How may one determine the most profitable fertilizer to buy?

This can only be answered by actual test. That which proved profitable for your neighbor, two miles away, may not be suitable for you. The experience of others may, however, have some value, hence we append the following results obtained from tests made by the Indiana station:

"On clay and loam soils, the complete fertilizer made the greatest increase in yield. But a smaller yield with potash and phosphoric acid

and no nitrogen paid best. In other words, for corn, the nitrogen cost more than it was worth. The best paying corn fertilizer was phosphorus with potash second.

“Applied to wheat, the complete fertilizer not only made the best increase, but paid best. Each element paid, but, as in corn, nitrogen gave least profit, potash next, and phosphoric acid stood at the head of the class. It paid better to use two hundred pounds of complete fertilizer on wheat than one hundred pounds. Fertilizers paid better on wheat than on corn. The results on oats were very much like those on wheat in bushels of increase, but not necessarily in profit.

“On timothy, the complete fertilizer gave better results than nitrate of soda alone, especially the second year.

“Heavy purchases of nitrogen for corn and wheat did not seem to pay. Heavy applications of fertilizers seemed to last, like manure, and raw rock phosphate did not seem to do much good until the second year. In nearly all these experiments, phosphorus seemed to pay the best.”

How much fertilizer should be used?

This, of course, depends upon the conditions. If plenty of humus is present, 200 to 600 of complete fertilizer should be sufficient. If humus is not supplied, the amount of commercial fertilizers will have to be increased each year to get the same results.

What costly mistake in buying fertilizers do farmers often make?

Farmers often pay \$35 or more per ton for a fertilizer rich in nitrogen when all that is needed is phosphorus or lime. Acid phosphate, containing 18% phosphorus, can be purchased for about \$14.00 per ton. To supply the other elements when they are not needed would mean a loss of \$21.00 per ton.

How may a farmer determine what fertilizers his land needs?

By laying out different plots, about a rod square, and testing for himself. Supply nitrogen to one, phosphorus to another, potash to another, lime to another, also make different combinations. Leave a block with no fertilizer to act as a check. The next season the farmer may profit by his results.

Will a chemical analysis show what plant foods are lacking?

It will not. To be available as plant food the substances must be in a soluble condition. The soil may contain many thousand pounds to the acre of potash or phosphorus locked up in rocks, yet these very elements may have to be supplied to get good crops. The chemist can not tell, by his analysis, whether the food elements are available for plants, or not. Do not bother your experiment station, about soil analyses.

What may be said in general, of the use of commercial fertilizers by farmers?

In general, it may be said that farmers use too much artificial fertilizers. More attention should be given to drainage, tillage and the turning under of green crops. The supply of humus in the soil should be kept up in order to get the most profit from the land. Once get into the habit of turning under a few green crops each year, such as clover, rye, or buckwheat, and the need for artificial fertilizers will soon be done away with.

Mention some of the crops and the fertilizers usually needed for each.

Alfalfa, lime;

Grass crops, nitrogenous fertilizers;

Corn, phosphorus;

Potatoes and turnips, potash.

In general, it may be said that well rotted stable manure, which contains all the plant foods that are needed, is the best fertilizer that can be applied.

What soil always needs potash in order to yield crops?

Muck soil always lacks potash and will not produce good crops without it. Many other black soils, often called by the farmers "made lands," will be improved by potash.

What are some of the conditions upon which the profit from the use of commercial fertilizers depend?

On the seasons (whether wet or dry), drainage and cultivation.

When the land is sour what element is usually lacking?

Phosphorus, which is usually associated with lime.

FERTILIZER DON'TS.

Don't expect fertilizers to take the place of green manure.

Don't buy fertilizers and let your manure piles go to waste.

Don't expect to get much benefit from fertilizers on land that is poorly drained.

Don't expect fertilizers to take the place of good tillage and cultivation.

Don't forget that, if there is no humus in the soil, that the amount of fertilizers must be increased each year to get the same result.

Don't run heavily in debt for fertilizers unless you are reasonably sure that they are needed and will pay.

Don't forget that lime and good drainage are, probably, more important than fertilizers.

Don't pay for fancy names.

Don't use fertilizers blindly, determine by test what your soil needs.

MANURES.

Distinguish between barnyard and stable manure.

Barnyard manure is from the feeding stalls and the yards and contains the droppings mixed with straw, hay, corn stalks, etc. Stable manure is free from external refuse.

Compare the value of barnyard and stable manure with that of artificial fertilizers.

Barnyard and stable manure are not only a direct plant food, supplying nitrogen, phosphoric acid and potash, but they also supply humus which is always needed.

Is the practice of putting the manure on the land in piles to be spread later, a good one?

No; by this method about one-half the value is lost by a process known to the chemist as *denitrification*. It also causes the crop to be uneven in growth and in ripening.

When should manure be applied to the land?

As soon as possible after making. If directly after making, so much the better. This saves the full value of the manure.

On an ordinary dairy farm with thirty to forty cows how much is lost each season by not properly caring for the manure?

Nearly enough to pay the wages of a good hired man through the summer.

Give some rules for the care of manure?

1. It should be kept under cover, away from the influences of the sun and rain. On many farms the manure piles are not only exposed to the weather, but they are directly under the eaves of the barn. After every shower streams of black, rich water may be seen running away and going to waste. If left exposed the manure pile will lose about one-half its value in four months.

2. Save the liquid manure by using absorbents or catch it in a cement pit. A little money spent for these purposes would be well invested.

Can anything be applied to the manure pile to prevent loss?

Acid phosphate and "floats," one part of the former to two of the latter, will help. This also makes the manure a more evenly balanced fertilizer, since, when used alone, it contains nitrogen in excess. For use of land-plaster, see answers under lime.

How should manure be spread?

Always from the wagon, preferably with a manure spreader. A light dressing of manure over a field each year is much better than heavier applications at longer intervals.

Why is the manure spreader an advantage?

It spreads the manure evenly, makes it finer and thus more quickly available. A ton of manure spread with a spreader as soon as made is worth four times as much as when left until fall and imperfectly spread.

How does the manure of different animals differ in value.

Young animals, poor animals, and those producing a rich product, as milk, or those doing hard work, more thoroughly digest their food, hence their manure is of less value. Animals in good condition fed with rich feed, produce a correspondingly richer manure.

Grade the farm stock according to the richness of their manure.

Pigs, fowls, sheep, horses, cows. A 1,200-pound horse will produce about \$30 worth of fertilizer in a year; a cow \$19, a hog \$12, and a sheep \$2. To obtain these values the manure must be used to the best advantage.

How may manure be kept from heating?

When manure is packed very hard the air is excluded and it heats very little. Often manure is put on cement floors under sheds and the cattle allowed to run on it all winter. In the spring when drawn out it will be well preserved and very little of its value lost.

What is green manure?

By green manure is meant any green crops that are turned under to furnish plant food and humus.

MANURE DON'TS.

Don't expose the manure piles to the action of the sun and rain.

Don't put manure in piles on the land to be spread later.

Don't pile manure around the trunks of trees; spread it as far out as the limbs go.

Don't let your horse manure accumulate; it will heat and spoil.

Don't put clear manure in hills in contact with seeds.

Don't forget that liquid manure is immediately available as plant food and should be saved.

Don't mix lime with manure; use land plaster, acid phosphate or "floats."

Don't leave manure in the stables to scent up the barn and taint the milk.

Don't forget that manure properly cared for and rightly used is one of the props that keeps up the prosperity of the farm.

IMPROVING THE SOIL WITHOUT COMMERCIAL FERTILIZERS OR BARNYARD MANURE.

What methods may be used to improve the soil without commercial fertilizers or barnyard manure?

Draining, liming and turning under green crops. The methods must, of course, conform to the conditions. If land is wet and soggy, hardly anything can be accomplished without drainage. If the owner can not afford to tile drain, make deep surface ditches where they will do the most good. After draining determine if the soil needs lime. When the field has been drained and limed, turn under green crops.

What green crops are the best for poor soil?

If the soil is very poor, begin with rye. This will grow when all other crops will fail. Do not attempt to raise clover on poor soil. For a second crop, buckwheat may be grown, or another crop of rye.

How did an Illinois farmer increase his hay crop from practically nothing to more than three tons to the acre?

He plowed the land in the fall and spread air-slaked lime over it at the rate of two tons per acre, harrowed it very thoroughly and sowed to rye, using three and one-half bushels to the acre. During the latter part of the next May the rye was plowed under, the field again harrowed thoroughly and sown to soy beans, two and one-half bushels to the acre. In September the plants were turned under, a chain having to be used on the plow, the field harrowed and again sown to rye at the rate of three bushels to the acre. The next spring, about the middle of May, the second crop of rye was turned under, the field again thoroughly harrowed and seeded to a grass mixture containing ten quarts of timothy, six of mammoth red clover and two of red top. The growth was rapid and in August the young plants were clipped high. The next season the timothy stood as high as the horses' backs with a fine clover bottom. The field yielded over three tons of cured hay to the acre.

Under what conditions are crops turned under more valuable than commercial fertilizers?

When the soil lacks humus. Soil so worn out that it contains no organic matter is not much benefitted by commercial fertilizers. After humus has been supplied, fertilizers may be used with profit.

What indications point to a lack of humus in the soil?

When the soil is light colored and tends to become hard.

What plants are valuable as a fertilizer, besides supplying humus?

The legumes, clover, alfalfa, soy beans, etc. They take up nitrogen from the air and decaying give it up to the soil.

What must always be done when bringing up poor land?

The land must be thoroughly tilled. Good tillage not only destroys weeds, but it conserves moisture and brings new food within the reach of plants.

How should clay land that tends to harden in clods be treated?

Plow in the fall and leave to the action of the frost. Such land usually needs lime and humus. If plowed in the spring, the clods should be harrowed down at once. Tile draining should have a marked effect on such land. Unless in the fall, always harrow newly plowed land as soon as possible after plowing.

LIME.

What are the functions of lime in the soil?

(1) Corrects sour soil; (2) promotes the growth of useful soil bacteria; (3) helps to liberate plant food; (4) helps to soften hard clay; (5) enables sandy soil to retain more moisture; (6) renders some of the toxic substances of the soil less injurious; (7) acts as a direct plant food for alfalfa and some other members of the clover family.

What are some of the indications of the need of lime in the soil?

(1) When moist soil will turn blue litmus paper red; (2) the presence of moss and sorrel; (3) failure of red clover on the soil; (4) the succession of timothy by red-top.

Discuss the blue litmus paper test for sour soil.

Soil acidity may be tested with blue litmus paper in two ways: (1) Bury a piece of the litmus paper in the soil to be tested. If, on its removal, the paper shows a red color after drying, it is a reasonably sure indication that the soil is sour and in need of lime. Under certain conditions, however, the soil solutions may decompose the coloring matter of the paper, leaving a red color when the soil is not actually sour. For this reason the litmus paper should remain buried only a few minutes. (2) Place a sample of the soil to be tested with twice its bulk of water in a fruit jar, shake thoroughly and let settle. If the clear liquid above turns blue litmus red, the soil is sour.

A NEW TEST FOR ACID SOIL.

A much more reliable and satisfactory test for soil acidity has recently been devised by Prof. E. Truog, of the Agricultural Department of the University of Wisconsin. It is somewhat more complicated than the litmus paper test, and special, though simple, apparatus is needed. The test is conducted as follows:

Place in a 300 c.c. Erlenmeyer flask 5 grams of chemically pure zinc sulphide and 50 grams of neutral calcium chloride, consisting of the dihydrate, $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$, or 75 grams of the hexahydrate, $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$, exactly 9 c.c. of soil and add 250 c.c. of pure water. Boil for one minute over a steady flame (alcohol or Bunsen burner), then place over the mouth of the flask a filter paper, that has been moistened with a 10% solution of lead acetate and dried, and boil for exactly two minutes more. If the soil is sour, hydrogen sulphide, an ill smelling gas, will be driven off and will discolor the paper, forming lead sulphide with the acetate. A bulletin has been prepared by the university with a color chart representing different degrees of acidity. The exact measurements of amount of soil and time of boiling form a basis for determining acidity in different degrees.

Discuss the need of lime in the soil.

Most crops can not be raised successfully unless the soil contains an ample supply of lime. The heavier the land, the more lime will be needed. Light, sandy and gravelly soils may be injured by using too much lime. Not only do crops cause a loss of lime in the soil, but the use of some commercial fertilizers hasten its removal, sometimes even to the extent of 1,000 pounds in a single year. The more animal manure, fertilizers, or green manure you apply, the more lime you will take out, and this should be replaced. The roots of leguminous crops turned under can not decay properly without the use of lime; and unless they decay, the nitrates stored by the bacteria are not available for the following crops. Without lime the land becomes hard and proper cultivation impossible.—Farm Economics.

Mention in their order some of the crops that are benefited by lime.

Beets, alfalfa, cantaloupes, clover, peas, beans, onions, celery Kentucky blue-grass, timothy, wheat, oats, barley and most seed and stone fruits.

Mention some plants that are indifferent to lime?

Corn, millet, golden rye, potatoes and carrots.

What plants are injured by lime?

Watermelons, strawberries, cranberries, huckleberries, red-top and sorrel.

What are some of the varieties of lime that are used as fertilizers?

Ground limetstone, quick lime and hydrated lime.

What cautions should be observed in buying lime?

Always be sure which variety of lime you are buying and pay accordingly. Quick lime, which has the highest lime value, is also sold under the names of burned lime, caustic lime, lump lime, stone lime and calcium oxide. When water is applied to it it "slakes" and becomes hydrated lime, e. g., lime with water added, also known as agricultural lime, water-slaked lime, calcium hydrate, precipitated lime and by other fancy names. An instance is recorded in which a man bought quick lime for \$4.50 per ton, added water to it and sold it under the name of hydrated lime at \$11.00 per ton. This gave him about \$11.00 per ton for all the water that he added.

What are the relative values of the lime compounds?

Chemically, 56 pounds of quick lime are equal to 74 pounds of hydrated lime and to 100 pounds of ground limestone. It will be seen, therefore, that it will require about twice the amount of ground limestone and a third more of hydrated lime to equal the same weight of quick lime. The fineness of lime is an important factor in determining the comparative values of its different forms. Unless ground very fine, limestone will not give satisfactory results, especially the first year.

What are some other substances that furnish lime?

Gypsum, marl, ground shells, phosphate rock and wood ashes. Gypsum is not now used to correct sour soil, as it has in itself an acid-forming ion. Wood ashes contain about 33 per cent. of lime and are usually beneficial.

Which form of lime is the most beneficial?

Authorities have not yet agreed upon this point. On heavy clay soils which are somewhat moist the quick lime would, probably, be more satisfactory, while on black soils, containing plenty of humus, the writer would advise the use of one of the other forms.

What is the relation of lime to potash?

It must be remembered when purchasing lime that, strictly speaking, lime is not a plant food, but simply an agent that sweetens sour or acid soils. It tends to make available a part of the potash naturally in the soil, and it has a similar effect on the crude forms of organic nitrogen. The continued use of lime alone will lead to a serious soil depletion, unless the necessary plant foods are supplied.

The use of lime is of great value to the farmer when conditions justify its use; and while it will tend to release soil potash, yet it will in no wise take the place of potash.

There are some soils that are improved by the use of lime; there are others that are not. There are some crops benefited by liming, some are indifferent to it, while a few are injured by it. Lime is a valuable agent, but it should not be used indiscriminately. Before applying lime to the field, know the reason why you are using it. Guesswork should not enter into the methods of the reading farmer.—The Practical Farmer.

How should lime be applied?

Lime should be applied after the ground is plowed and thoroughly mixed with the soil by harrowing or disking. The more thoroughly it is mixed with the soil the better and quicker the results will be. It should never be plowed under, because its tendency is to work downward rather than upward in the soil. Apply lime with a spreader after the ground has been plowed. Do not drill lime in with seeds, nor mix it with commercial fertilizer, nor use it in place of fertilizer. Apply lime to meet the lime requirement of a soil, and when this has been done use manure and commercial fertilizers in the ways that have been found profitable for the crops which are to be grown, regardless of the fact that lime has been applied.—Bulletin 131, Pennsylvania State College.

In what sections of the United States is lime most needed?

New England, New York, Pennsylvania, New Jersey, Delaware, Maryland, Virginia, the coast states of the South and some of the Central States. Many portions of these, however, do not need lime.

Will lime interfere with the action of fertilizers?

If applied separately, lime will not act on fertilizers to any appreciable extent. If lime is mixed with fertilizers or manures before applying to the land, it will cause them to lose their nitrogen.

May lime be applied directly to the soil without plowing?

Yes. While it is desirable that the lime should be as thoroughly incorporated with the soil as possible, it is often practicable to apply it to the unplowed land, preferably in late summer, fall, or winter when the ground is bare.

What is important in order to get the full benefit of lime?

The addition of manure and the turning under of green crops are absolutely essential to receive the continued benefit of lime.

How much lime should be applied per acre?

From 500 to 800 lbs. of quick lime, or equivalent amounts of the other varieties. It is better to apply once in two or three years, rather than to apply large amounts at longer intervals.

What is land-plaster and for what is it used?

Land plaster is another name for gypsum. It is a whitish, odorless, non-corrosive powder obtained by grinding a natural rock found in Nova Scotia and other places. While it should not be used as a lime, it is the best substance now known for absorbing liquid manure and for preventing the escape of ammonia. Use it liberally upon the floors and under the roosts in poultry houses, and wherever ammonia gas is escaping. It will pay well to throw some upon the manure piles, especially upon the horse manure.

LIME DON'TS.

Don't expect lime to take the place of fertilizers.

Don't buy of unreliable dealers.

Don't use lime when it is not needed.

Don't store quick lime.

Don't pay more for hydrated lime than you would for quick lime.

ALFALFA.

What is alfalfa?

Alfalfa (Arabic, *best-fodder*; French name *lucern*) was known in Asia 490 B. C. It is a deep-rooted, long-lived perennial belonging to the clover family (Leguminosæ); stems one to four feet high resembling sweet clover; flowers purple, rarely white, leaves slender and toothed near apex. It is the most valuable of the forage crops.

Where can alfalfa be raised?

Alfalfa can be raised in all parts of the United States and on some part of every farm.

What conditions are necessary for growing alfalfa?

1. The soil must be well drained. The safest way to prepare for the crop is by a thorough system of tile drainage. Alfalfa will not flourish on wet, soggy soil. A good rule is to try to raise it only on such soil as would grow a good crop of corn in a very wet season.

2. The soil must not be sour. A good coat of lime, from 1,000 to 2,000 pounds per acre is usually necessary.

3. The soil should be inoculated. By this is meant supplying to the soil those bacteria which are necessary for plant growth. It is not always necessary to do this, as the bacteria may already be in the soil. If they are not there, the plants will make a very weak, puny start and then die.

4. The soil should be free from weeds. Thorough preparation must be made in this particular, as the young alfalfa plants are tender and easily choked out. It is well to precede the alfalfa with a cultivated crop, or summer fallow and kill all the weeds by dragging as often as they start up.

5. The seed bed must be well supplied with humus, well harrowed and firmly packed. A layer of dry lumps or dry manure a few inches under the mellow surface would spoil the crop. See that the soil is well mixed, moist and fine down to the solid ground.

When should alfalfa be sown?

No specific rule can be given when to sow alfalfa, as it depends upon the season and the soil. As a general rule, it should be sown in the spring, about the middle of May, in the North, and in the fall in the South. If the ground is weedy, it is generally better to keep it harrowed during the summer and sow the seed in August. That seeded in the fall, however, must run the chance of insects and dry weather. Should September and October be very dry, late sowing would probably be disastrous. Alfalfa needs plenty of moisture, although it cannot live in undrained soil.

How may bacteria for inoculating be obtained?

1. The Department of Agriculture, Washington, D. C., will supply, free of charge, sealed tubes of the culture with full directions for its use.

2. Two hundred to 400 pounds of soil from any successful alfalfa field would be sufficient to inoculate one acre.

3. Soil from ground where sweet clover has grown for several years contains the same bacteria and may be used successfully.

How much alfalfa seed should be sown per acre?

From 15 to 25 pounds in the East; 10 to 15 pounds in the West.

What varieties of alfalfa are the best?

Grimm and Turkestan are the only two varieties that are hardy in the North. The Turkestan was imported from Turkey under the auspices of the United States Department of Agriculture. The Grimm originated in Carver County, Minnesota, and was introduced by the Minnesota Experiment Station. It seems to be a little hardier than the Turkestan.

What are the enemies of alfalfa?

Dodder, a parasitic plant with a long slender stem and no leaves, is about the only enemy that preys upon alfalfa in the North and East. Very close cropping by horses or sheep will often destroy the dodder plant, while giving the alfalfa only a temporary set-back. Foxtail is the worst enemy in the West.

How may good alfalfa seed be obtained?

It cannot always be obtained. Get samples and submit them to your experiment station.

How may dodder seed be removed?

A 20-mesh sieve of No. 34 wire will remove practically all the dodder seed.

Should alfalfa be sown alone or with a nurse crop?

It is usually safer to sow alone. Very good results have been obtained, however, by sowing it with oats or beardless barley, five pecks to the acre, and cutting when in milk. This furnishes a valuable forage crop, and, in very hot seasons, protects the alfalfa. The alfalfa should be about six inches high in order to withstand the winter.

What is a striking peculiarity of alfalfa?

Its roots go deep into the soil and take up plant food entirely out of the reach of any other crop. For this reason it needs a deep soil and is not affected by dry weather.

When should alfalfa be cut?

Cut alfalfa as soon as the red blossoms appear, or, as it has been said, "when ten per cent. of the plants are in bloom."

How should alfalfa be cured?

It may be cured and put into the mow the same as timothy, or it may be put into the silo for silage. If the crop matures during the rainy season, about the only way to save it is to put it into the silo or use for soiling.

What may be done to hasten the growth of a thin alfalfa crop?

Go over it with a disc harrow. This often seems to give the crop a new lease of life.

Why is alfalfa valuable?

This is best answered by quoting the following "Alfalfa Proverbs" from the *Farm Journal*:

Alfalfa is the best soil doctor, and it adds humus to the soil.

Alfalfa increases the milk flow.

Alfalfa is high in feeding value, and balances the corn ration. Grow your protein—don't buy it.

Alfalfa sod grows larger corn crops.

Alfalfa is the greatest of all subsoilers, and has no equal as a hog pasture.

Alfalfa keeps stock in good condition, and should be grown on every farm where it can be grown.

An alfalfa field is a hog's idea of heaven.

Foxtail is the greatest enemy of alfalfa.

Growing alfalfa is good farming.

Alfalfa means more money and better homes. Raise what you feed and feed what you raise.

Alfalfa does things, and never loaf on the job; with a fair chance it always makes good.

Alfalfa fills the haymow and pays for the privilege; it is the cheapest and best feed for beef and cattle.

Alfalfa insures larger yields from the crops that follow. It contains more protein to the ton than clover or corn.

Alfalfa is the agricultural wonder of the twentieth century. It yields from two to three times as much as clover or timothy, and is more valuable than hay.

ALFALFA DON'TS.

Don't sow alfalfa on wet or sour soil.

Don't sow alfalfa on weedy ground.

Don't neglect to inoculate the soil.

Don't turn the cows into the alfalfa when the dew is on it, unless you want to lose them.

Don't let the alfalfa get too ripe.

Don't neglect to write to your experiment station for their bulletins on alfalfa.

Don't cover the alfalfa seed deep.

Don't get frightened if the alfalfa does not come up thick and rank at first; give it time, especially if the right conditions have been provided.

Don't be afraid that you cannot get rid of alfalfa, once you get it started. You will not want to get rid of it, any more than you want to get rid of your best cow.

POTATOES.

What are potatoes?

Irish potatoes are enlargements of the underground stems of the plant. Sweet potatoes are the enlarged roots.

On what kind of soil can potatoes be raised?

Potatoes may be raised on almost any soil, provided it contains the proper plant-food.

What kind of soil is best adapted to potatoes?

Potatoes do the best in a rich, sandy loam, well drained and well supplied with humus.

How should the soil be prepared for a good crop of potatoes?

A clover sod on well drained soil is the best foundation for a good crop of potatoes. Other legumes (alfalfa, cow-peas, soy beans, peas, beans and vetches), buckwheat and rye are profitable crops to turn under for potatoes. Plow deep and harrow to the same depth, using an Aeme harrow or a spring-tooth drag. If the ground is plowed in the fall and again in the spring, so much the better. Potatoes do best in mellow soil.

If it is not feasible to turn under green crops, what fertilizers may be used?

Commercial fertilizers or well rotted stable manure. Unless the manure is very thoroughly rotted, it should be applied to the previous crop. Commercial fertilizers should never be applied directly to the potatoes.

What brand of commercial fertilizers is the best for potatoes?

This will depend, as for any other crop, on what the soil lacks. In general it has been found that the best potato fertilizer is one that contains a large per cent of potash.

Are wood ashes a good fertilizer for potatoes?

Wood ashes should never be used on potatoes, as they promote scab.

How should the seed-pieces be cut for planting?

Opinions differ widely on this point; but it is, probably, best to cut the potatoes lengthwise and put only one piece in a hill. Large seed-pieces do better than small ones.

Is there any choice between the seed-end of the potato and the stem-end as regards seed?

The seed-end sprouts sooner and will give a better yield than the stem-end.

What affect does early sprouting in the cellar have upon the value of the seed?

The early sprouts in the cellar sap the life of the tubers. If they are broken off before planting, numerous weak and useless shoots grow from the injured eyes.

Is it advisable to plant small potatoes?

Small potatoes, if planted from hills that produced only small potatoes, are almost sure to produce a similar crop. When selected from good hills, small potatoes will do very well, but the general practice of planting them should be discouraged.

How much seed is required per acre?

Uncut seed, 10 to 12 bushels; cut seed, 8 to 10 bushels.

When should the seed potatoes be cut?

Ordinarily it does not matter; but the seed pieces should not be left in piles, as they would soon heat and spoil. In a cold, wet season freshly cut seed rots much more quickly than that which has been allowed to dry. If a cold wet spell is expected, better plant whole potatoes.

When is the best time to plant potatoes?

Plant early potatoes as soon as the ground is warm, probably about the middle of May. Late potatoes should be planted about a month after.

Mention some good varieties of early potatoes.

Early Ohio, Six Weeks, Early Rose, Early Andrus, Salzer's Earliest Bovee, Michigan, Early Trumbell.

Mention some good varieties of late potatoes.

Carman No. 3, Sir Walter Raleigh, Green Mountain, Rural New Yorker No. 2.

How deep should potatoes be planted?

Potatoes should be planted about four inches deep. The potatoes formed are very little deeper than the seed pieces; hence when planted near the surface the potatoes are apt to get sunburned and unfit for cooking.

How far apart should potatoes be planted?

Plant in rows about three feet apart and from 15 to 18 inches apart in the rows.

How much should potatoes be cultivated?

Cultivate every ten days until the tops cover the ground. If the season is very dry, cultivate shallow often enough to have the ground covered with a thin dust mulch. This will prevent the moisture from escaping and insure a good crop.

What objection is there to planting potatoes on sod ground?

Sod ground very often abounds in white grubs, the larvæ of the May beetle. These eat into the potatoes and destroy them.

How may heavy clay soil be fitted for potatoes?

Turn under a green crop such as clover, rye or buckwheat. See questions and answers under drainage.

Why do potatoes run out?

Potatoes "run out" because of the poor selection of seed. If seed is selected each year from the most prolific hills, the potatoes will not only not "run out," but the yield will be greatly increased.

What is considered a good yield of potatoes?

The average yield in the United States for the last ten years was 76.6 bushels per acre. Professional growers expect from 200 to 300 bushels per acre, and yields of from 500 to 800 bushels are often reported. For such crops, however, all the conditions of soil, climate and cultivation must be perfect.

How are new varieties started?

Spread the seeds of the ripe potato ball on a paper and let them dry. The seeds may be planted either in a box in the house or in warm mellow soil out doors early in the spring. Each seed will usually produce a new variety which will require three years to mature. Plant the whole potato each year. The first year the potatoes will vary in size all the way from that of a pea to potatoes large enough for cooking. The smallest ones are usually not worth saving. The potato balls are very rarely found on highly developed potatoes, but may be obtained of seedmen.

Occasionally, but not often, new varieties, termed "mutations" or "sports," develop in the hills of standard sorts. These may perpetuate their characteristics, or they may revert to the old type.

When is the best time to market potatoes?

In the long run it is much more profitable to sell potatoes directly from the field when dug. Storing in the cellar necessitates more labor, incurs the loss due to rotting and shrinking and the risk of lower prices in the spring.

What causes potato blight?

There are several kinds of blight; as, the early blight, late blight, tipburn, flea-beetle blight, etc. The early blight and the late blight do the most damage. The early blight first appears as circular yellow spots near the edges of the leaves. These gradually increase in size, become brown, the leaves roll up, the stems are affected and the plant dies. This blight does not cause the potatoes to decay. It is caused by a parasitic fungus which takes root upon the leaves and saps their vitality. Dry weather is favorable to this blight.

The late blight is also caused by a parasitic plant (*Phytophthora infestans*) and is much more serious than the first blight, as it causes the potatoes to decay. It is at first noticed as irregular-shaped, brown spots on the leaves. These spread rapidly and soon kill the plant. Warm, moist weather is favorable to late blight.

How may potato blights be prevented?

Potato blight may be prevented by persistent spraying with Bordeaux mixture. Begin spraying when the plants are about six inches high, before the blight appears, and repeat about every ten days. Use a machine that will give a fine spray with considerable force. The plants must be thoroughly covered.

What causes scab on potatoes?

Various causes have been assigned for scab, but it is, probably, due to a fungus growth which may be either planted with the potatoes or which lives in the soil in which potatoes have been planted.

How may potato scab be controlled?

An absolute preventive of potato scab has not yet been discovered, but the following methods are more or less effective:

1. Soak the potatoes before cutting, for two hours, in a solution of 1 pint of 40% formalin to 30 gallons of water. If not planted at once, they must be spread out to dry.
2. Expose the potatoes to the sunlight before planting until the outsides become green.
3. Do not plant on scab-infested ground.
4. Do not use lime, wood ashes or barnyard manure for fertilizer.

The plowing under of green crops has no effect on scab fungus which will live in the ground about six years.

What is the cause of the dry rot and the wet rot so often seen when potatoes are in storage?

These rots are caused by bacteria which may have their origin in the stem rot in the fields, or from infected bins. All bins should be thoroughly cleaned and disinfected before the new crop of potatoes is put in. A warm, moist cellar is very favorable to the development of the rots.

Which is better, hill culture or flat culture?

This of course depends somewhat upon the season; but, if potatoes are to be raised on a commercial scale, flat culture is the only method to be recommended.

How did one potato grower increase his yield more than 300 per cent?

1. He plowed the field in the fall, turning under a heavy growth of red clover.

This seems to be about the best method of fertilizing for potatoes. The Wisconsin experiment station (Bulletin 117) reports a test of different fertilizers with the following result: Green clover, 241

bushels per acre; 10 tons of stable manure, 197 bushels per acre; 700 pounds of commercial fertilizer, 192 bushels per acre; no fertilizer, 174 bushels per acre. The test was made on sandy soil.

2. He had obtained his seed by going over a hand-dug field and selecting the best tubers from only those hills which yielded at least six merchantable potatoes.

Few farmers seem to realize, as yet, the importance of seed selection in potato husbandry. The writer once kept separate the potatoes from all hills which yielded at least seven good tubers, finding only about a half dozen in a half-acre field. The next year he planted ten rows of about 50 hills each, using for one row the selected seed and for the others potatoes as they run from the bin. A difference in foliage was noticed almost from the start, that from the row with the selected seed being much more vigorous and stocky. When dug this one row yielded as many good potatoes as were obtained from the other nine. Did the selection pay?

3. He began spraying with Bordeaux mixture when the tops were about six inches high, and sprayed seven times during the season. When the striped bugs began to appear, he added 3 pounds of arsenate of lead for every 50 gallons of the Bordeaux mixture.

4. He began cultivating about as soon as the tops were out of the ground, at first deeply then more and more shallow, keeping a mulch of fine dry dirt on the surface during the dry season.

Give the life history of the Colorado beetle.

The eggs are laid on the under side of the leaves almost as soon as the potatoes are up. These soon hatch out dark-reddish slugs whose main business is to eat. The slugs, or larvae, attain their full growth in about three weeks after which they go into the ground to pupate, becoming beetles about a month after hatching. There are, sometimes, four generations a year.

What is "potato canker"?

"Potato canker," also known as "black scab," "warty, or cauliflower disease," first made its appearance in Hungary in 1896. It has spread through Europe and is now getting a foothold in upper Canada, having been brought to that country in imported potatoes. The disease is not indicated by the potato vines. It begins in the eye of the potato, in small, rusty brown nodules, which quickly grow, assuming a cauliflower-like form, until the potato becomes a shapeless mass with an unpleasant, rotten odor.

What may be done to prevent "potato canker"?

See that your own seed is sound and do not use any imported stock. If canker appears in the field, do not plant more potatoes there for at least six years. No remedy has, as yet, been found for the disease; and only eternal vigilance can prevent it from ruining one of our most important crops.

POTATO DON'TS.

- Don't plant on poorly drained soil.
- Don't expect to raise potatoes on soil that contains no humus.
- Don't neglect to cultivate.
- Don't use lime sulphur on potatoes.
- Don't plant potatoes on the same soil year after year.
- Don't plant seed from poor hills.
- Don't let the seed sprout in the cellar, if you can prevent it.
- Don't cut your seed and then leave it in piles to spoil.
- Don't wait until the blight appears before you begin to spray.
- Don't fail to go through the bins now and then and remove every rotten potato.

CORN.

What states comprise the famous "Corn Belt" of the United States?

Ohio, Indiana, Illinois, Iowa, Nebraska and Missouri.

In what other parts of the United States may corn be raised?

In the entire eastern half, except the extreme north and south, and in parts of most of the Western States.

How many types of corn are there?

Six, dent, flint, pop, sweet, pod and soft.

What climate is best suited for corn?

Corn requires a high temperature during the growing season, long days of bright sunshine, warm nights and plenty of moisture.

What is the most profitable variety of corn to plant?

The largest that will ripen in your section. Each farmer must determine this for himself. In general, the flint varieties, because of their earliness are raised in the East and the dent varieties in the West. A few of the early dent varieties are now beginning to displace the flint varieties of the East.

What is a good crop to precede corn?

Clover or grass. A clover sod on which well rotted barnyard manure has been spread during the previous winter or spring is ideal.

What kind of soil is best suited for corn?

A well drained, sandy or gravelly loam, well supplied with humus. Corn may, however, be raised on any kind of soil, provided it has sufficient depth and richness.

How should land be prepared for corn?

First, select good soil. Corn is not a poor land crop. Plow deep and harrow thoroughly both ways. A good crop cannot be obtained unless the ground is mellow. One of the common mistakes of farmers is that they do not prepare their land thoroughly. Going over it once more with the harrow will often increase the crop ten per cent. The finer the soil, the more plant food it will give up.

What is one of the most important factors in securing a good corn crop?

Selected seed. Go through the field at cutting time. Select vigorous well-leaved stalks, cut, and when thoroughly cured, husk and place the ears in a pile by themselves. If there is sufficient number, save only from stalks that yielded at least two good ears.

Give rules for selecting ears?

Select medium ears, well filled with straight rows and well rounded at both ends. The color should be bright and the kernels

firm on the cob. The ears should not hollow in from butt to tip, but should taper very gradually. Save ears that are uniform in size and shape.

What care should be given to ears after they have been selected?

They should dry thoroughly before being allowed to freeze; then store in a dry place where they will not be subjected to extremes of heat or cold.

What should be done with the seed just before planting?

Test to determine if the seed will grow. One cause of a poor crop of corn is the poor stand. It is estimated that every poor ear planted causes a loss of \$4.00. The corn expert of today knows not only every kernel he plants will grow, but also that its vitality is strong.

How can seed corn be tested?

Prof. P. G. Holden, of the Iowa Agricultural College, suggests the following method:

“Make a box three inches deep and 30x30 inches in size; fill it about half full with moist sawdust and tamp firmly with a brick. Rule off a piece of good cloth into squares $2\frac{1}{2} \times 2\frac{1}{2}$ inches checker board fashion, and number the squares 1, 2, 3, etc. Place the cloth, which should be the size of the germination box, on the sawdust and tack it to the sides and ends of the box. Lay the ears of corn to be tested side by side on the table or floor. Remove six kernels from six different places from ear No. 1 and place them in square No. 1 in the germination box, germ side up, and crown pointing from you. Then remove six kernels in a like manner from ear No. 2 and place in square No. 2 in the germination box, and so on. When the squares in the germination box are all filled, lay a piece of good cloth over the kernels and dampen by sprinkling water over it. Place over this a cloth considerably larger than the box and fill the box with moist sawdust, tamp with a brick or board and firmly pack on top of the corn. Keep the box in place where it will not freeze; raise the upper side of the box, or the side toward which the crowns of the kernels point, three or four inches; the stem sprouts will then grow up and the root sprouts down, thus making it easier to read the test. It requires about five days for the corn to germinate. At the end of that time roll back and remove the cloth containing the top layer of sawdust. Now remove the second cloth as carefully as possible and examine the six sprouted kernels in each square.

“The above box when completed and set away for germination may be described briefly as follows: Two inches of sawdust packed firmly in the bottom of the box. On this is laid the cloth ruled off in squares; then the kernels laid in squares, the second cloth laid on the kernels and dampened, then a third cloth much larger than the box, on which is placed two inches more of sawdust packed firmly. The edges of the larger cloth may be folded over on top of the sawdust. Soak

the sawdust at least two hours—better over night. Use a good quality of sheeting for the cloth that is ruled off in squares, and also for the cloth covering the kernels. Do not use a cheap, porous grade cloth, as the sprouts will grow through it and greatly interfere with the work.

“Leave a two-inch margin around the edges of the box to prevent freezing and drying out. Make the squares to receive the kernels $2\frac{1}{2} \times 2\frac{1}{2}$ inches. Never use the box more than once without thoroughly scalding both the sawdust and the cloths. To insure accurate reading, the stem sprouts should be at least two inches long when examined. Throw out all ears that show weak germination, as well as the ears whose kernels fail to grow.”

Describe the “ear and row” method of obtaining seed corn.

Select fifty to one hundred of the best tested ears and plant a row from each, using half the kernels on the ear; number the rows and the remaining half-ears so that you may determine what row each ear produced. It will be found that some rows will be much stronger and more prolific than others. Use the remaining seed from the ears that produced the rows for the next year’s crop. The ears of the rows, being cross fertilized, would not breed true to seed.

When should corn seed be planted?

Plant when all danger of frost is over and the ground is warm.

How deep should corn be planted and how many kernels in a hill?

Plant just deep enough to obtain moisture, from $\frac{1}{2}$ to $1\frac{1}{2}$ inches. A great deal of corn is planted too deep. Plant in rows, $3\frac{1}{2}$ feet each way, three kernels in a hill. If the variety is small, or it is planted for silage, it may be planted closer and more in a hill. Use a horse planter if any considerable acreage is planted; if only a small amount, a hand planter may be used.

Give rules for cultivating.

Go over the field with a weeder three or four times after planting to kill the weeds that are just starting. When the corn is three or four inches high it may be cultivated at least six inches deep and close to the hill; but later, when the roots begin to spread, only shallow cultivation is permissible. Many farmers lessen their crop from 10% to 15% by cultivating so deeply that the fine food-seeking roots are injured or destroyed. Two and one-half inches is deep enough after the plants get well started. Never go through the corn with a shovel plow.

How often should corn be cultivated?

Often enough to kill the weeds. If the season is dry, cultivate at least twice a week, or often enough to keep a mulch of fine dry dust about two inches thick on top of the ground. This will conserve the moisture and give it to the growing plants. Water does not easily penetrate fine, dry dust. The dust mulch is one of the secrets of successful corn growing.

What fertilizers are best for corn?

Well rotted barnyard manure is the best. Commercial fertilizers, especially those rich in phosphorus, will pay; but they should be sown broadcast, rather than placed in the hill. A compact handful of fertilizer placed in the hill of any plant will do more harm than good.

What is the cause of corn smut?

Corn smut is caused by a fungus that may affect any part of the plant above ground. The ripened spores of smut fungi are carried by the wind; and when they fall on the moist surface of any part of the plant, not too mature they take root and grow. Soft tissue, caused by injury to the plant, is a fruitful field for smut spores.

What fields of corn are most liable to corn smut?

Corn grown on rich, moist soil. Such corn makes a rapid growth and exposes much tender surface.

How may corn smut be controlled?

Burn all affected stalks from the old crop. Gather all the pos-tules from the new field and burn them. The field should be gone over at least three times during the season to be effective. The smut may be controlled by spraying, but this method is not to be recommended.

When should corn be cut?

If for silage, cut as soon as the ears begin to glaze; if for the corn, leave a little longer, or until the lower husks begin to turn white. Leave in the field until well cured.

What care should be taken of husked corn to prevent it from spoiling?

It should be piled loosely in an open crib, which will allow the air to circulate freely through the sides and bottom. A special wire is now made for corn cribs; this not only admits the air, but is rat proof.

Mention some of the uses of corn on the farm?

Corn may be fed to all kinds of stock and poultry. During the cold weather the horses, when not at work, will do nicely on timothy with a dozen good ears of corn three times a day. Hogs may be fat-tened on corn cheaper than on any other kind of food. It is neces-sary for poultry, especially during the cold weather. It is not a hot weather food. A mixture of one part of corn meal to two of oat meal makes an excellent ration for cows. The writer does not advise feed-ing corn on the ear to cows. Corn stalks are valuable as a coarse food when properly balanced with other rations.

CORN DON'TS.

Don't use poor seed.

Don't plant too close.

Don't neglect to cultivate.

Don't expect a good crop on poor, wet soil.

Don't plant before the ground is warm.

Don't let corn get too ripe before cutting.

Don't plant corn in succession on the same field.

Don't forget that commercial fertilizers will not pay so well on corn as they will on earlier planted crops.

Don't plant varieties nearer than 300 feet, if you want to keep them separate.

Don't let the weeds get the start of you.

Don't forget that deep cultivating will injure the crop.

Don't forget to plant a pumpkin seed in every fourth hill, if you want a good feed to fatten a cow.

Don't let your corn spoil after you get it husked.

Don't forget that clover turned under makes a good fertilizer for corn or for any other crop.

OATS.

What are the essentials for a good crop of oats?

1. A well prepared seed bed;
2. Good seed;
3. An early start in the spring.

How should the ground be fitted for oats?

It should be well plowed and thoroughly harrowed. An inch, or two, of fine dirt with hard, unbroken soil beneath is not a good seed bed for any crop. Mellow it deep. Ground cannot be properly fitted with a peg-tooth drag. Oats respond readily to fertilizers; but care should be taken not to use too much nitrogen, as it causes a too rank growth of straw. Oats do best in a cool, moist climate and on rather heavy soil.

What care should be used in selecting seed oats?

Seed oats should be well cleaned, and all light and immature grains removed. It is the heavy oats that produce the big yield. They should weigh not less than forty-five pounds to the bushel. It is always well to treat the seed for smut, as described in another chapter.

Why is it important to sow oats early?

Oats need a great deal of moisture, especially at ripening time. If sown late, they might have to ripen in a dry spell, and a poor crop would be the result.

When should oats be cut?

Oats should be cut just as the grain has passed the milk stage, or when the field is about one-half yellow. If left until dead ripe, the grain will not weigh so much to the bushel and the straw will be of poorer quality.

On well prepared soil oats yield from forty to sixty bushels per acre. There is no great difference in varieties.

What may be said of oats as a stock food?

Whole oats is one of the best feeds for horses; while ground oats, especially if mixed with other grains, make an excellent feed for nearly all other kinds of stock. Its straw is better for stock than that of any of the other cereals.

How should oats be sown?

Drilling is the most satisfactory method of sowing oats. This gives them an even depth and they are more thoroughly covered. From two to two and one-half bushels per acre should be sown.

What may be said of oats as a nurse crop?

Oats are considered a good nurse crop, although wheat and barley are better. The oats cover the ground too thickly and require so much moisture that the seeding is often killed out.

WHEAT.

What different types of wheat are raised?

Soft winter wheat, semi-hard winter wheat, hard winter wheat, soft spring wheat, hard spring wheat and macaroni wheat. The hard wheat, from which the best flour is made, is raised in Kansas, Nebraska, the northern part of the United States and Canada. The softer varieties are raised in the more humid section of the East.

What soil is best for wheat?

Heavy clay loams are best for wheat-raising. The ground should be fitted the same as for oats. Wheat, however, is a "finer feeder" than oats, so needs a richer soil. The raising of wheat has largely been abandoned in many sections of the East.

When and how should wheat be sown?

Spring wheat is sown as early in the spring as the ground can be worked; winter wheat is sown early enough in the fall to get a good stand before winter. Wheat is best sown in drills, and usually it will pay to apply a fertilizer rich in phosphorus. Sow from six to eight pecks to the acre, depending upon the size of the seed.

BUCKWHEAT.

What may be said in favor of the buckwheat crop?

Buckwheat is an easy crop to raise, as it does well on almost any kind of soil. The fact that it must be sown later than the other crops, in order that its blossoms may "set" in cooler weather, is often an advantage to the busy farmer. Buckwheat always finds a ready market and the price is advancing every year. It makes a most excellent feed, although usually it is more profitable to sell it and buy something cheaper. It is an excellent crop to precede potatoes, but should not be followed by oats or corn. It is useful both as a cover crop and a catch crop.

How should buckwheat be sown?

Buckwheat may be drilled in or sown broadcast, about one bushel to the acre. It responds readily to fertilizers.

THE HAY CROP.

What is the best meadow grass?

Timothy is by far the best meadow grass for the North. Clear timothy makes an excellent roughage for horses; and, mixed with clover, it is an excellent feed for cattle or sheep.

When should timothy be cut?

Cut timothy just as it begins to blossom; i.e., when the pollen begins to appear on the heads. If allowed to get too ripe, it becomes woody, unpalatable for the stock and the succeeding crop is injured. This rule also applies to clover which should be cut as soon as it is in bloom.

THE CLOVERS.

What are the most important clovers for the northern farmer?

White, red, alsike, crimson and sweet.

Describe white clover.

White clover is a low trailing perennial with small white blossoms. It is too low for meadows, but should be found in every pasture mixture, as it spreads rapidly and will often cover the ground where other feed is lacking. Its blossoms supply the best honey for bees.

Describe red clover.

Red clover (medium and mammoth) is, with the exception of alfalfa, the most important legume for the northern farmer. It supplies nitrogen to the soil, its long roots furnish humus, and, as a feed, it helps to balance timothy which has a much too wide nutritive ratio. Red clover ripens with timothy, which makes it a favorite with farmers. It lasts about two years; and, if sown alone, will yield two

crops in a season. Turned under for green manure, clover makes a better fertilizer than can be purchased. No progressive farmer will attempt to get along without it. Sow the seed in the spring.

What is alsike clover?

Alsike clover is a shorter and more slender variety than the red clovers and is somewhat earlier, which works to its disadvantage when sown with timothy. It makes a finer hay than do the red varieties, but it is not so good a yielder. Its merits seems to lie in the fact that it will often succeed on soils where the other varieties will not grow.

What is crimson clover?

Crimson clover is an annual which should be sown in the fall. It is often sown as a catch crop after early potatoes or as a cover crop in orchards. It sometimes proves very valuable for early pasture. About 15 pounds to the acre is used, when sown alone. It requires good soil, needs considerable heat and does best south of the Ohio River.

What may be said of the merits of sweet clover?

Sweet clover, found growing wild in many sections of the North, is now becoming popular as a remarkable soil builder and as a feed for stock. Its roots seem to be a better harbor for nitrogen forming bacteria than either clover or alfalfa. It starts early in the spring and will afford feed for twice as many cows per acre as will any other crop. Cattle fed on it never bloat. It will grow on poor soil under conditions where clover and alfalfa would fail. Sow seed at the rate of fifteen pounds per acre. Seed and further directions for growing may be had from A. A. Berry Seed Co., Clarinda, Iowa, or of E. Barton, Falmouth, Ky.

STRAWBERRY CULTURE.

Mention some of the secrets of successful strawberry culture.

If there is any secret of successful strawberry culture it is the secret of plant selection, using the mother plants which show a tendency to develop a heavier crown system and fruit-producing organism than other plants. This not only prevents varieties from deteriorating, but it also increases the fruitfulness of the variety.

What kind of soil is best adapted to strawberries?

Any soil that will produce flowers, vegetables or common farm crops will also produce strawberries. Certain kinds of soils are not so important as the manner in which the soil is prepared. If I were to have a preference of soils, I would select sandy loam, or mellow clay loam, not because these soils will grow better strawberries, but because they are more easily worked.

How should a field be prepared for strawberries?

In preparing soil for strawberry plants it should be plowed late in the fall, and during the winter months it should be covered with manure, using at the rate of fifteen to twenty tons per acre, the quantities of manure used depending upon the present condition of the soil. In the spring this manure should be thoroughly mixed with the soil by discs, spring tooth harrow and such tools. If the soil is deficient in phosphorus, it should have an application of 400 pounds of bone meal applied to each acre and thoroughly worked into the soil in connection with the manure. Phosphorus is the element which aids plants in assimilating other ingredients which they could not use without the phosphorus. This element also aids in bringing plants into full maturity. About the only way a farmer may intelligently determine whether or not his soil requires an application of phosphorus is by the crops it produces. If his soil has been giving satisfactory yields, it is more than likely that it contains sufficient phosphorus to build up a satisfactory crop of strawberries.

Mention some of the desirable varieties of strawberries.

There is a large number of varieties of strawberries, all of which do well in some particular locality. The most dependable varieties are those which have been tested throughout the United States and have been found to be satisfactory in all classes of soil and under all climatic conditions. These varieties are Early Ozark, Warfield, Glen Mary, William Belt, Senator Dunlap, Haverland, Brandywine, Sample and Chesapeake. This list of varieties will give the grower berries from the very earliest to the latest. They are all productive varieties and are universally popular.

When should strawberries be set?

The best time to set strawberry plants is just as early in the spring as soil will permit. During the early spring months straw-

berry plants are in a dormant condition; the roots are calloused and when properly pruned will send out feeding roots and begin growing immediately. Fall planting is undesirable for the simple fact that during the fall months plants are in a green, succulent, growing condition and are perfecting their fruit-bud system, and to transfer them at this time is a greater shock upon the plants than would be the case if they were transferred in the spring during their dormant period.

Give directions for setting strawberry plants.

Strawberry plants should be pruned before setting. The tip ends of the roots should be cut off with shears or a sharp knife. The roots of the plants should extend straight down into the opening which is made in the soil for them, and the soil should be pressed up against the roots very firmly. The crown or body of the plant should extend just above the surface of the soil, as it is from this crown runners form, which are important in the way of filling in the row to suit the grower.

What care should be given the plants the first year?

The first year plants are set they should have thorough cultural methods. The first cultivation should be given immediately after plants are set, and these cultivations should be repeated every week or ten days throughout a dry season, and cultivation always should be done as soon after each rain as the soil will permit. Shallow cultivation is preferable, because the roots of strawberry plants work near the surface and it isn't good practice to break any of these feeding roots. Two weeks after plants are set they begin to blossom. These flowers should be picked off, which will relieve the plant from undergoing the strain of pollen secretion. To allow a plant to fruit soon after it has been set greatly weakens the plant and often causes it to die. In a few weeks after plants are set runner plants will begin to form. These runner plants should be allowed to set directly in line with the original row and along each side of the rows until each row of plants is about 12 or 15 inches wide. Runners which form after the row has been made, should be pulled off and treated the same as weeds. Cultivation should continue until late in the fall, and during the early winter the plants should be mulched with straw or some coarse material.

What care should be given the plants the second year?

After plants have fruited their first crop the vines should be mowed off and if weather conditions are favorable the mulching, together with the old foliage should be burned. This destroys any insects or fungus spores which may be present. When I speak of favorable weather conditions I refer to such conditions as will permit the foliage to dry, so that it will burn quickly. But should it rain soon after the vines are mowed off, it would prevent the burning for several days, and in this case the plants would be sending up a new growth, which would be injured by burning. In this event the mulching and old foliage should be raked into piles and hauled away.

Is it necessary to spray strawberry plants?

It isn't necessary to spray strawberry plants unless some insects are working upon the foliage. Should insects be present, a spraying of arsenate of lead should be applied at once, using three pounds of the arsenate of lead to fifty gallons of water, or seven ounces of Paris green to fifty gallons of water. For smaller quantities of spraying material use the insecticides according to the amount required for the patch of plants which is to be sprayed. Should the plants be affected by any fungus spores, such as leaf spot, blight or mildew, they should be sprayed with Bordeaux mixture, using what is known as the 4-4-40 solution.

How may the farmer get a good price for his strawberries?

If a farmer wishes to secure the top-notch price for strawberries, he must grow the kind of fruit that will put him in a class by himself and the only way to accomplish this is to set a strain of plants that are so perfectly developed in their fruit-producing organisms as to make it possible for them to produce berries of the fancy kind. In picking the berries they should be picked so that each berry will retain its full calyx and a piece of the stem. This calyx and stem will prevent air from getting into the berry, which will aid it in holding its shape and color nicely. The berries should be graded when picked, putting fancy berries and second-grade berries by themselves. Then arrange the top of each box in an attractive way. If these simple rules are followed, the farmer should have no trouble in getting a price for his berries that will give him a larger return than he could get from any other crop.

How often should new strawberry plants be set?

Strawberry plants should not be allowed to fruit for more than two seasons. Therefore, a new field of plants should be set every other year. When plants are allowed to fruit for three or four years, they become greatly deteriorated and conditions are made favorable for insects and fungi. In some districts where strawberry plants have been allowed to fruit for a number of years insects are doing considerable damage and causing much alarm.

Is it profitable to raise your own plants?

Only a few farmers and fruit growers find it profitable to grow their own plants. Growing strawberry plants and nursery stock of all kinds is a work which requires deep thought and great care and unless this work is carried on along scientific lines it isn't profitable. I certainly would not advise anyone to grow strawberry plants from the plants which are allowed to fruit. This is very bad practice and always results in a loss, because when plants are taken up from the fruiting bed the roots of the plants which are left for fruiting are interfered with, which naturally causes a loss of fruit.

What care should be given the plants when they are first received?

When plants are first received from the nursery the lid from the plant crates should be removed and the crate set into a cool cellar or cave, providing conditions will permit the grower to set plants within a day or two of their receipt. If for any reason the plants cannot be set for several days after they arrive, a trench should be dug in a shady place and the plants heeled in. This work should be done in the cool of the evening, and the soil where the plants are heeled in should be thoroughly soaked, and the plants should be watered every evening until they can be transferred to the field.

What is meant by "male" and "female" strawberry plants?

A male variety develops flowers which have both male and female organs. The center pistil cones of the flowers are surrounded with anthers' or male organs, which are filled with pollen. When these anthers become ripe they burst and the pollen is distributed over the pistils at the receiving point and carried into the ovaries, which causes the development of seeds, around which is formed the fleshy part of the berry. The female varieties produce flowers of a strictly female character, which develop only the pistil cones. The flowers of these varieties must receive their pollen from male varieties. Therefore, all farmers and fruit growers should bear in mind that the female varieties should be set in rows between rows of male varieties. A mistake at this point will cause not only a small yield of fruit, but berries of ill-shape with hard, undeveloped ends.

How far apart should strawberry plants be set?

The distance rows should be made apart will depend entirely upon the system growers propose following. The most popular system for growing strawberries is what is known as the double-hedge-row or narrow-matted row. Where this system is followed the rows should be made three feet apart and plants set two feet apart in the rows. These plants should be allowed to make enough runners to fill in the vacancies between the original plants and enough runners to form on both sides of the rows until the rows are about 12 to 15 inches wide. This system requires 7,250 plants per acre.

Mention some causes of failure in strawberry raising.

1. Neglecting to keep out the weeds and grass.
2. Starting new fields from plants taken from worn-out fruiting beds.
3. Lack of thorough and systematic cultivation.
4. Failure to burn over the old bed before starting it anew.
5. Failure to spray properly, if necessary.
6. Neglect to prepare a rich, mellow seed bed.

RASPBERRIES.

What is the best soil for raspberries?

The raspberry prefers a sandy or light clay loam on a cool slope, if possible. The soil should be fertile, well drained and contain plenty of humus.

What are the leading commercial varieties of red raspberries?

Cuthbert, Marlboro, Golden Queen, Shaffer and Columbian.

When and how should red raspberry plants be set?

Set early in the spring from six to eight inches deep, so that the roots will be well covered. If a large acreage, set in rows nine feet apart and three feet apart in the rows. This will permit the use of the manure spreader and give ample room for cultivation. If only a small patch is to be set, the rows may be as close as six feet.

How should red raspberries be cared for?

Cultivate thoroughly and keep free from weeds. One row of tomatoes or two of any other crop may be planted between the rows the first year. When the plants are about two and one-half feet high, pinch off the tips to thicken the stalks and encourage branching. The plants will bear the second year. As soon as the crop has been picked, the bearing wood may be cut out and removed. The plants increase by suckers which will come up very thickly. Keep them cut between the rows, leaving a narrow row about six inches wide for next season's crop. In the spring cut from this row all weak and winter-killed canes and prune the other back to about three and one-half feet.

What is the best fertilizer for red raspberries?

Nothing is better than well rotted barn-yard manure applied with a manure spreader. Ashes and hen manure are very good, as are also muriate of potash and ground bone.

When should red raspberries be cultivated?

Begin to cultivate in the spring as soon as the soil will permit. Care should be taken not to cultivate too deep. Keep the weeds down and the suckers back. Good cultivation and plenty of fertilizer bring the big berries.

How much may be realized from an acre of red raspberries?

This will depend upon the market, but sales may be counted upon to run from \$100 to \$300 per acre. Growers usually give two cents per quart for picking. Marketing in pint baskets is now becoming popular, since the berries do not settle so much and the price is usually a little higher.

How should black raspberries be set and cared for?

Black raspberries may be set the same as red ones. They propagate from the tips which bend over and take root in the soil. To prevent this the tips should be pinched off when they are about three and one-half feet high. Some varieties of black raspberries have the habit, the first year, of trailing on the ground. These long vines should be kept in the rows; and when the tips begin to spread out and look yellow they may be covered for new plants. They will take root and the old stalk may be cut away in the spring. Black raspberries may be kept in hills. As with the reds, the bearing wood may be cut out as soon as the crop is gathered. All old wood should be piled and burned.

What are the leading varieties of black raspberries?

Gregg, Black Diamond, Cumberland, Kansas and Plum Farmer.

How much may be realized from an acre of black raspberries?

If good care has been taken of the field, black raspberries may prove even more profitable than red ones. As high as \$500 has been realized from an acre, but this is exceptional.

What are the leading varieties of blackberries?

Blowers, Snyder, Eldorado, Lawton, Mersereau, Rathbun, Erie and Ward.

How should blackberries be set and cared for?

Set same as red raspberries. Keep well cultivated and pinch off tips when five or six feet high. Thin out suckers same as for reds and remove old wood when through bearing.

What disease often attacks blackberries and how may it be eradicated?

Often blackberries are attacked by the "red rust," which may be recognized by its resemblance to a red dust. The leaves and stalks turn pale, wither and die. There is no known cure for this disease. Dig the diseased plants up and burn them.

RASPBERRY DON'TS.

Don't use soiled baskets.

Don't employ poor pickers.

Don't set out more than you can take care of.

Don't wait until the buds start before setting out in the spring.

Don't spoil your market by putting poor berries on the bottom.

Don't neglect to fertilize and cultivate, if you want a good crop.

CURRENTS.

What are the best varieties of currants?

Wilder, Cherry, Red Cross, Pomona, Fay's Prolific and Perfection. For a general purpose currant, the writer prefers the Wilder to all other varieties. It is large, a good yielder, of good flavor and hangs well on the bushes after ripening. The bunches do not dwindle down to small fruit at the point, as is a characteristic of several other varieties.

What care do currants need?

Currents require about the same care as raspberries. Good crops need not be expected unless the bushes have been well cultivated and fertilized. They should be set in rows six feet apart each way.

What pruning do currants require?

A small part of the old wood should be removed each year during the dormant period. As soon as the leaves start in the spring cut out all sickly and dead canes and burn them. Borers are probably in them, and in this way they may be kept in check.

How are currants propagated?

Currents are propagated by layering or by cuttings. To propagate by layering, bend down, in the spring, strong, vigorous branches and partially cover them with dirt. Roots will start at the points. In the fall the branches may be separated from the parent plants and a new plant started for every set of roots.

What enemies prey upon currants and how may they be destroyed?

Stalk borers, currant worms and white lice. To prevent the stalk borers, cut and burn all dead stalks as soon as they appear. To kill the currant worms sprinkle with fresh powdered hellebore in the morning while the dew is on. Currents must be watched closely for the appearance of worms. If not killed as soon as they appear, they will soon strip the bushes of their leaves and destroy the crop. If there are too many bushes to be dusted conveniently, they may be sprayed with a solution of hellebore, using one ounce of the powder to ten quarts of water.

The lice, which work under the leaves and cause them to puff up in red spots, may be destroyed by spraying with a tobacco solution or with a dilute solution of whale oil soap. For these insects it will be necessary to shoot the spray up under the leaves.

CURRENT DON'TS.

Don't let the worms get the start of you.

MARKET GARDENING.

What should be the first precaution when starting in the business of market gardening?

Be sure that there will be a market for what you raise. The art of finding markets and getting good prices ranks equal in importance with the ability to grow good vegetables. It has often been said of a gardener: "He knows how to raise good stuff, but does not know how to sell it." While all produce may be sent to commission men in nearby cities, the alert producer will contract with hotels, restaurants and boarding houses for considerable above the wholesale prices.

What kind of soil is adapted to market gardening?

Deep, loamy soil, well drained and sloping toward the south. In other words, a market gardener must have what is known as "early land"—land that can be plowed early in the spring and in which seeds will germinate and grow before ordinary agricultural land can be worked.

How should the market gardener's land be fitted for crops?

It should be rich and mellow. Deep plowing and thorough tillage before planting are absolutely necessary for success.

Give some of the general rules for planting market garden crops.

Always plant in rows so that cultivation may be done either with a horse or hand cultivator. The market gardener will have on his hands a constant fight with weeds. If he has plenty of land, it will be best to plant so that all can be cultivated with a horse. The direction on seed packages give distances at which the plants will mature, but not the most convenient distances for working.

In what order may vegetables be planted?

Lettuce, onions, cabbages, radishes and beets may be planted as soon as the condition of the ground will permit. Beans, vines and corn should not be planted until the ground is warm and all danger of frost is over.

What is the best fertilizer for the market gardener?

As with nearly all crops, vegetables do the best with well rotted stable manure. If this can not be had, a commercial fertilizer rich in nitrogen should be used.

Give directions for raising beets for market.

Sow only the early red turnip varieties. The seed may be sown by hand or with hand drills in rows at least 20 inches apart. The seed should be covered about one-half an inch deep. When the plants are about two inches high, thin to three inches. Keep the weeds down. When the beets are 2 to 3 inches in diameter they are ready for market.

Pull, wash and remove all dead leaves. Tie in bundles of three each. The price ranges from 15 cents to 30 cents per dozen bunches, according to season and supply.

Give directions for raising onions for market.

Use sets and plant in rows 20 inches apart, half an inch deep and about two inches apart in the row. When ready for market, cut off the fibrous roots, pull off the outer discolored sheath and tie in bundles of four. The price ranges about the same as for beets, while the work of preparing for market is much less.

How should cucumbers be planted?

In hills six feet apart each way. Dig a hollow, throw in one or two shovelfuls of rotted manure, or a couple of handfuls of phosphate, mix well with the earth, cover with fine dirt and plant 15 or 20 seeds covering $\frac{1}{4}$ inch deep. After the plants are well started and safe from bugs, thin to four or five of the best plants in a hill. This rule may be followed for squashes and melons.

How may vines be kept free from striped bugs?

If only a few vines are raised, get soap or craker boxes, knock out the bottoms, cover with mosquito netting or wire door screen and place over the hills. Boxes alone, by shutting off the cold wind, will cause the vines to make a better growth than they otherwise would. If boxes can not be used, the vines may be sprayed with an arsenate of lead solution, or sprinkled with old slaked lime, or common road dust.

How should a garden be cared for in a very dry season?

Keep a fine dry mulch of dirt on the surface, same as for potatoes and corn. Do not water the vegetables. Artificial watering has a tendency to bring the roots toward the moisture on the surface; and unless the practice is kept up constantly and thoroughly, it will do more harm than good.

What are some of the directions for raising cabbages?

Early cabbages should be started in a seed bed as early as the ground can be worked. When they are five or six inches high they may be transplanted in rows three feet apart and 20 inches apart in the rows. This gives ample space for cultivation with a horse; in fact, many growers plant as close as two feet. Cabbages are heavy feeders and the ground should be rich to get good results. Late cabbages may be sown three or four weeks later than the early ones.

What must be done to protect the cabbages from cabbage worms?

Dust the cabbages with "Slug Shot" or "Bug Death" as soon as the worms are hatched. It will be necessary to go over the field two or three times during the season. Devices for applying the powder may be purchased of any seed firm.

What is club root and how may it be prevented?

Club root (*Plasmodiophora brassicae*), also known as "club foot" and "clump foot," is a disease that affects the roots of cabbages causing them to swell up in knots and bunches. The leaves of the plant gradually wither and then die. Turnips, cauliflowers, brussels sprouts, kale, radishes, kohl-rabi and rutabagas are often affected by club root, but not so badly as cabbages. The disease is caused by a micro-organism which is not a bacterium nor a fungus, but a slime mold. There is no sure preventive, but the following measures are recommended:

1. Be sure to start the young seedling in unaffected soil.
2. On small plots sulphur may be often used with very satisfactory results.
3. Quick lime at the rate of 75 bushels to the acre, applied the fall before, will be beneficial.
4. All infected leaves and roots should be collected and burned.
5. Don't raise cabbages successively on the same field. The spores of the disease have great vitality and will live in the ground from five to ten years.
6. Never feed the diseased parts to animals whose manure is used on the soil.
7. If purchasing stable manure, see that it is free from the spores of the disease.

What quick-growing fruit may be set to add to the income from the garden?

Peaches, plums, dwarf pears, raspberries, gooseberries and currants.

What are some of the best varieties of peaches for the North?

Early varieties: Greensboro, Graves, Champion, Early Rivers, and Early Crawford.

Later varieties: Elberta, Fitzgerald, Niagara, Late Crawford, and Hale.

What is leaf curl and how may it be controlled?

Soon after the peach leaves come out in the spring they are apt to curl up and become twisted into almost shapeless masses. The condition is caused by a fungus which works in the inside of the leaves. Leaf curl can be satisfactorily controlled by spraying the trees, while dormant, with lime-sulphur solution, diluted at the rate of 1 to 10, or with bordeaux mixture of the 5-5-50 formula. There are two common causes of failure: (1) The spraying is not done early enough, and (2) it is not done thoroughly. When the buds begin to break, it is too late to spray for leaf curl. The spraying must be done so thoroughly as to cover the branches on all sides.

How may peach borers be controlled?

Dig out with a sharp knife, or kill by thrusting a wire into the hole. Spray around the base of the tree with bordeaux mixture to which arsenate of lead has been added.

FLOWERS.

What are the best bulbs for fall planting?

Lilies, narcissus, tulips, jonquils, scyllas, snowdrops, crocuses and anemones.

When should these bulbs be set?

Set bulbs any time between September and December.

How deep should bulbs be set and how far apart?

Lilies, 12 inches apart each way, top of bulb to be 6 inches deep; narcissus, 6 to 12 inches apart, 4 inches deep; tulips, 4 inches apart, 3 inches deep; jonquils, 6 inches apart, 3 inches deep; scyllas, 3 inches apart, 2 inches deep; snowdrops, 2 inches apart, 2 inches deep; crocuses, 2 inches apart, 2 inches deep; anemones, 4 to 6 inches apart, 1 inch deep.

What flowers may be raised profitably by farmers for commercial purposes?

Asters, gladioli, peonies, sweet peas and a few others.

Give directions for raising asters.

Asters must be started in a green house, the seeds being planted about the middle of March. When all danger of frost is over they may be transplanted in the open ground, about 18 inches apart. Rich, warm, sandy loam, containing plenty of humus is necessary for the best results. Barnyard manure should be spaded or plowed under the year before. Do not put manure in the hill.

How should asters be prepared for market?

They should be cut with as long stems as possible. Pull off the lower leaves and tie in bunches of twenty-five each. Begin packing by making a pillow of crushed newspapers on which the blossoms are laid, the stems resting on the bottom of the box. Begin the next layer a little farther back, and so on until the box is full. Put in the top of the box, before nailing on the cover, a paper with your name, address and the number of bunches.

Where may asters be sold and at what price?

They may be shipped to the flower commission men whose names are listed in this book. They bring from 10 cents to 25 cents a bunch, according to quality and season. Often contracts may be made with large hotels to supply their tables with bouquets for the summer season.

What variety of asters are most salable?

For early asters, *queen of the market* and *break of day* are the best; for late varieties, any of the large branching varieties are good. Only white or pink asters should be raised for market. The heads should be full, showing no yellow centers.

What cautions should be observed in raising asters?

Look out for the black aster bugs which often destroy the crop. They may be controlled by dusting with slug shot, or by knocking off into a pan of kerosene or hot water. Do not put manure in the hills and do not try to start too many in the boxes; if too crowded, they are apt to wither at the base of the stems and die.

What are the cultural directions for sweet peas?

Select a location where the peas will receive the sun all day. Dig a trench about ten inches deep and a foot wide, place four inches of well-rotted manure in the bottom and pack firmly. On top of this place two inches of mellow soil, plant the peas in a row about one inch apart and cover four inches deep with mellow dirt. Before the peas are up a trellice should be made for them. Good stout brush is ideal for this purpose; but if this is not at hand, wire netting or strings may be used. As the vines climb the trellice, a mulch should be filled in around them to prevent drying out. Sweet peas need much moisture and should be watered freely.

When should sweet peas be planted?

Plant sweet peas in the spring just as soon as the frost is out of the ground. They can not be planted too early.

How should sweet peas be prepared for market?

City markets use only the light colored varieties of sweet peas, white, cream, or light pink. They must be perfectly fresh, have long stems and be tied in bunches of twenty-five each. The stems are usually tied with a white thread, six or seven times around, and the ends cut even. The blossoms should be picked every other day; if they are not picked, pods will develop and the vines will stop blooming.

What pests prey upon sweet peas?

Cutworms and soft-bodied lice are the worst enemies of sweet peas. Lime will help to keep the cutworms away, or they may be fed poisoned bran, as explained under "Insecticides." The lice may be controlled by spraying the vines with a tobacco or a whale oil soap solution.

BEES AND BEE-KEEPING.

Where can bees be kept?

There are few places in the country where one or more colonies of bees can not make honey. It is true that the natural surroundings may be unfavorable to the bees, but one who has had no experience is often astonished as to distance bees will go in search of the nectar of the flowers. In almost every large city there are some bee keepers who have bees right in the heart of the city, either in back lots or on the roof of buildings. Ordinarily, bees will go from one to three miles in search of nectar, but if there is none nearer they will go much further. There are cases on record of bees going seven miles from home.

What must be planted for bees to work on?

Strange as it may seem, it usually does not pay to plant anything that is valuable only for the honey unless waste places such as roadsides or fence corners can be utilized that would be of no value in any other way. Very often the natural sources of nectar in a locality can be augmented by the sowing of sweet clover seed, and since this is becoming to be known as a valuable forage instead of a pest or weed, as it was formerly called, there is no question but that it pays to grow sweet clover for hay and thus secure some additional honey of fine quality, also. However, it must be remembered that each blossom yields only a small amount of nectar, hence there must be hundreds of acres of any such plant before any great difference will be noticed in the surplus honey produced if there are very many bees in the locality. However, as stated first, almost every locality has enough natural sources of nectar for supporting one or more colonies without any artificial pasturage.

Since alfalfa clover and alsike clover are being grown more and more even by the farmers of the East, there is every reason to suppose that there will be more honey produced from these sources in the future than ever before.

If the honey-flow is light can sugar syrup be fed and the honey thus produced be placed on the market?

Sugar syrup can be fed and honey produced from it, but strictly speaking, such a product does not conform to the requirements of the Pure Food Law. There need be no fear of such an article being put on the market, for the bees consume so much syrup in the process that the price received for the honey would not begin to pay for the sugar and the labor of feeding. Sugar syrup is often fed, however, to supply winter stores, for it makes a safer winter food than many of the honeys gathered late in the fall that are rather strong in flavor.

Do bees do well in a fruit country?

The fruit trees alone, unless there are acres and acres of them, do not usually furnish enough honey to be noticeable in the surplus

supply secured, but of course there are many exceptions to this in localities where fruit is grown extensively. In this connection, however, it might be well to state that bees are a necessity in a fruit growing locality, for without their aid the blossoms do not set, that is the cross fertilization is not accomplished. It is true that other insects and the wind distribute the pollen to a certain extent and thus fertilize the blossoms, but at the same time, if there are no bees at all a great many of the blossoms will not bear fruit. A simple experiment may be tried to prove this: Cover a branch of blossoms with coarse mosquito netting which will just prevent the bees from getting through, and it will be found that the blossoms on this branch will not bear fruit, even though the netting is removed as soon as the petals fall.

Do bees work on ripe fruit and spoil it?

If the skin of the fruit has been punctured by some other insect or by birds, it is true that the bees will work on the pulp and juice of the fruit thus exposed, but such fruit would be unfit for market anyway, hence the bees after all do no real harm. Bees by themselves alone can not possibly puncture the skin of fruit. Sound fruit, if kept carefully guarded from birds and other insects, will be untouched by the bees. This has been demonstrated over and over again.

How many colonies of bees can one man care for?

This depends on the man and so this question can not be definitely answered any more than one could positively say how many acres of land one man could farm. However, one man with a little help in the busiest part of the season can usually care for as many as five hundred colonies, if he is experienced. Colonies of bees, in order to produce good results, must be properly taken care of. A thousand weak colonies not in good condition for producing surplus honey by the time the main honey-flow opens, will not produce as much as ten colonies that are very strong and in the very best condition at the time the main flow begins.

Is it possible to remove bees from hollow trees or the walls of a building?

Yes, this may be done without trouble, but the easiest way is to cut down the tree or remove some of the siding of the building, as the case may be; but if this is impractical a device known as a bee escape may be placed over the opening or entrance which will allow the bees to pass out but will prevent them from going back again. If a hive containing comb is arranged close to the opening on the outside, all the bees may be secured in this way, or practically all of them except the queen. A new queen will have to be on hand and introduced to the bees. Most of the modern books on bees describe the various processes of transferring bees from trees or buildings into hives, so that one who is desirous to start in this way need have no particular difficulty.

What profit can reasonably be expected?

As much as \$10.00 per colony has been secured, but this is considerably above the average. \$2.00 to \$3.00 a colony would be a safe figure.

How much increase can be expected in a year?

If natural swarming is allowed, a fifty per cent increase is perhaps an average. No colony should be allowed to swarm more than once, for the parent colony is too greatly reduced in strength if more than one normal swarm issues. Professional bee keepers usually make their increase artificially, however, and it is not at all a difficult matter to double the number of colonies in a year. In fact, an expert, when all conditions are favorable, can increase a three-frame nucleus which is only about one-third the size of an ordinary colony into ten full size colonies by fall, but of course this is beyond the reach of the average amateur.

Will beating tin pans, ringing bells, etc., stop swarms?

No. Almost every swarm immediately after it issues will soon cluster anyway at some convenient point until the bees get their bearings. How the custom of beating tin pans, etc., started no one knows. If a swarm is inclined to make for the woods at once, the bees can be made to cluster very quickly if a good spray pump is at hand for a good drenching so wets their wings that they are forced to cluster until they can dry off.

What kind of bees are the best?

There are not as many different varieties of bees as of poultry, for instance, owing to the fact that since the mating of the queens and drones takes place in the air, the male parentage can not be controlled, hence if a number of different varieties of bees were kept in the same yard they would soon be hopelessly mixed up and a mongrel bee be the result. The Italian bees are preferred by the majority of bee keepers in this country, although the Carniolan bees are beginning to be used somewhat, as are also the Caucasian.

How many kinds of bees are there in a colony?

During the early part of the summer a normal colony consists of one queen, the only perfect female in the hive—several hundred or thousand drones (the male bee)—and anywhere from twenty to fifty thousand worker bees, which are the undeveloped female. The queen is not the ruler of the hive as was formerly supposed, but is simply the mother—she lays the eggs. A good prolific queen in the height of the season will lay from two to four thousand eggs per day, or nearly twice her own weight in twenty-four hours. Continual feeding by the worker bees enables her to do this. The drone is the male bee and he has no sting nor any suitable tongue with which to work; hence the drone does no work, not so much because he is lazy but because he has no tools to work with nor weapons with

which to defend the hive. The workers are stunted females, and as their name indicates, they do all the field work such as bringing in pollen, nectar, etc.

Can one who takes care of bees keep from being stung?

Yes, if necessary, one can so protect himself with a good veil, gloves, etc., that there is practically no danger of receiving a sting; but practical bee keepers after they have been stung a very few times are not bothered very much in this way, for the stings lose their affect, that is the system becomes immune to the poison and no bad affects, whatsoever follow.

Is there any danger of bees stinging neighbors or their cattle?

There is some danger, but at the same time very little. Occasionally, sweaty cattle or horses if allowed to get in the direct line of flight of the bees, will irritate them so that they may be stung, but after all, such instances are not the usual thing. If proper precautions are taken, neighbors need not be annoyed in any way.

What is meant by "comb" and "extracted" honey?

Comb honey is produced by the bees in small, square boxes and is sold in this way just as the bees left it. The extracted honey is the liquid honey thrown out of large combs filled by the bees, in a centrifugal honey extractor which works somewhat on the principle of a cream separator. That is, the liquid honey is thrown out of the cells, leaving the comb as good as ever and it is put back in the hive and filled again by the bees. For this reason the extracted honey is cheaper as the bees do not need to build new comb each time.

Which is the more profitable to produce, comb or extracted honey?

This depends largely upon circumstances. One who has but a few colonies had better produce comb honey, for the equipment required for extracted honey production is quite expensive and the outfit would usually not be warranted for only a very few colonies. Professional bee keepers, the majority of them at least, produce extracted honey largely. Nearly twice as much of the latter can be produced as of comb honey, but at the same time it brings about only half as much in the market as comb honey.

When extracted honey crystallizes is that an indication that it was adulterated with sugar?

No, for almost every kind of pure honey will granulate or crystallize in time. Some kinds of honey produced in the south will crystallize in only two or three days time, but usually from two to six months is required. The honey may be returned to the liquid state by heating it gently in hot water. For the very best results the water surrounding the dish of water should be no hotter than 140 degrees. A temperature much higher than this if kept up very long will give the honey a burnt flavor.

What kind of a hive is the best?

This question can not be answered definitely. Complicated patent hives are usually very little if any better than the cheap wooden boxes that they are sold to replace. Dealers in bee supplies sell a standard ten-frame hive that is preferred by the majority of honey producers, but if comb honey is to be produced the upper part of the hive should be of a different style than if the bees are run for extracted honey.

What are the different parts of a bee hive?

A regular bee hive consists of a floor or bottom board; a brood chamber which contains the ten frames that surround the comb; the super that holds the square sections for the surplus honey, and the cover. The brood chamber is a plain box usually with notched or dove-tailed corners to give added strength, and with the ends of the box babbeted at the top to hold the projections of the top bars of the frame that surround the comb. The bees are induced to build the combs in these frames by means of a sheet of what is known as comb foundation that is suspended in the middle of each frame, which acts as a pattern to enable the bees to build their combs straight. If this were not used they might build the comb crosswise of the frame or in bunches and clusters, so that it would be impossible to separate one comb from another for purposes of inspection. The super or upper part of the hive gets its name from the fact that it holds the superabundance of honey. The modern bee keeper does not rob his bees; that is he does not take from them honey that they require for their own food, but simply removes the surplus of which there is often ten times as much as they could possibly use themselves.

When bees do not work properly in the super what must be done to correct the difficulty?

If there is a good honey-flow and still the bees are not storing the honey in the super, the chances are that the colony was not strong enough in bees to be in good condition when the honey-flow opened. Such colonies often do not get in good shape until the main flow is over, and of course no surplus honey is then produced. If the queen is not prolific this also would cause trouble, for the empty room in the brood nest tempts the bees to store the honey there rather than above, and when they get into the habit of storing below they do not readily change and store the honey above in the super.

How can the finished honey be removed from the hive?

The old way was to set the hive over a hole in the ground in which there was some burning sulphur, and after the bees were all killed to take the honey out with a spade. The modern beekeeper as mentioned above, does not remove the honey the bees need but simply takes the surplus. A board containing what is called a bee escape, is placed between the super and the brood chamber and the bees go down through into the lower part and can not get up again. In a few hours they are all out of the super and the surplus honey can then be removed without

the knowledge of the bees. There is then no uproar, no stings, no confusion and no trouble of any kind.

Can comb honey be manufactured by machinery so as not to be told from genuine?

No, this is impossible. Comb honey has never been made by machinery and never will be in spite of many newspaper statements to the contrary. The A. I. Root Company of Medina, Ohio, in order to show conclusively that there is no such thing as manufactured comb honey, has, for nearly thirty years, had a standing offer of \$1000.00 for a single section of comb honey made by machinery that so nearly resembled the natural product as to deceive the average person. The fact that no one has ever been able to claim this money, shows conclusively that there is no such article on the market. There are plenty of reasons why such a feat would be impossible, but lack of space forbids the mention of them here.

Do bees have diseases?

There are a few diseases of the adult bees such as dysentery, bee paralysis (not like paralysis of the human family); but the most serious diseases are those of the brood such as American or European foul brood. These, however, may be easily cured unless the bee keeper is so negligent as to allow his whole yard to become diseased before he does anything about it.

What is done with bees during the winter?

If the colonies are not already in double walled hives the space between being filled with shavings or leaves, a winter case may be put over the regular hive and packing material put in after which a water proof cover is put over the whole thing; or the colonies may be wintered in a cellar which is kept reasonably dark and even in temperature. Except in the northern part of the northern states, however, it is usually safer to winter on the summer stand in double walled hives or other hives especially packed for the cold weather. It does no harm even though the hives be covered with snow, unless the entrances should get stopped solid with ice.

If colonies die through the winter may new swarms the next season be put in the same hives?

If the bees did not die because of the result of the disease foul brood, but simply starved or chilled, there is no harm in putting new swarms in these same hives. By careful attention however, the winter loss may be reduced to a very small per cent.

THE ORCHARD.

How can the orchard be made to pay?

By proper pruning, spraying, cultivating, fertilizing and drainage.

When should the orchard be pruned?

It has been said that every month in the year is the time to prune orchards, but it is the safest to prune during the winter time when the trees are dormant. Hendrick, of the Cornell Experiment Station, gives the following "General Facts and Principles," which every fruit grower should know:

1. Winter pruning increases the vigor of the plant.
2. Summer pruning decreases the vigor of the plant.
3. Root pruning decreases the vigor of a plant.
4. Prune weak growing varieties heavily in the winter; strong growing sorts, lightly.
5. Suckers or watersprouts are often the effect of over-pruning.
6. Heading-in thickens the top.
7. Checking growth by girdling, notching or twisting may induce fruitfulness, but at the expense of vigor.
8. Heavy pruning of young trees delays fruiting.
9. All pruning must take into account the habit of growth of the tree.
10. Some fruits bear on this year's wood, others on that of last year, and still others on older growths; pruning must take the age of bearing wood into account.

How should old orchards be pruned?

Do not prune too much at one time. The first year remove little more than the dead, diseased and injured limbs and the watersprouts from the trunk of large limbs. The next year remove all cross limbs and thin out small branches so that the sun may enter freely. Cut out every limb that touches or rubs another.

What care should be taken in pruning?

When entire limbs are removed, cut close to the main trunk. If a stub of a limb is left, it will rot and cause a hollow. If surfaces of cuts are more than one inch in diameter, they should be painted. Do not cut off large limbs unless they are in the way. If they must be cut, saw on the under side first.

When should spraying begin and what should be used?

1. Spray before the leaf buds open, using commercial lime-sulphur, one gallon to eight gallons of water.
2. When the pink of blossoms show, spray again, using one gallon of lime-sulphur to forty of water. Add two pounds of arsenate of lead for every fifty gallons of solution.

3. When two-thirds of the petals have fallen, repeat, and two weeks later use same again.

4. Other spraying solutions are good, Bordeaux being the favorite of many. It is, however, not so effective as lime-sulphur. Care should be taken not to use the solutions too strong.

How should spraying solutions be applied?

As a fine spray under considerable pressure. It will readily be seen that, in order to make apple raising profitable, the orchard must be large enough to justify the purchase of effective spraying apparatus and the construction of tanks for the easy and convenient mixing of spraying fluids.

Mention some of the pests that infest the orchard.

Bud moth, canker worm, codling moth, San José scale, oyster shell scale, scruffy scale, blister mites, tent caterpillar, and many others.

Describe the San José scale.

The San José scale has the appearance of a minute oyster shell, but is darker in color. It thrives on the bark of trees, and, if not checked, will kill the trees, giving them a rough, brown appearance. The scale is carried from tree to tree on the feet of birds. Trees affected with it must be sprayed thoroughly and persistently. Besides lime-sulphur, some of the commercial spraying mixtures are excellent preventives.

Give the life story of the codling moth.

The codling moth is a small, gray moth that causes a large proportion of the wormy apples. The eggs are laid on the leaves or skin of the fruit. When hatched the worm enters the blow end of the fruit and the poison must be ready for its first meal. This is the reason why the arsenate of lead or Paris green is added to the lime-sulphur or Bordeaux. If the worm is not killed, it bores its way into the center of the apple where it remains and feeds until it is full grown. It then leaves the apple, crawls down the trunk of the tree and spins a cocoon under the loose bark. The next spring it emerges from the cocoon, a moth, and again begins laying eggs. In some sections two broods are hatched in one year.

Give rules for plowing and harrowing the orchard.

Plow shallow in the spring, as soon as the condition of the soil will permit, and cultivate thoroughly. After putting the soil in good tilth, harrow often enough to keep the weeds down and a good dust mulch on the surface. "Remember that cultivation is essentially manure." Go over it again after each rain, or as soon as the ground is in condition to work. Cease cultivating about the middle of July and sow a cover crop.

What may be sown for cover crops?

Buckwheat, oats, field peas, crimson clover, rye, soy beans, rape, or turnips. These should be allowed to ripen and rot on the field.

What are the uses of the cover crop?

1. To regulate the moisture in the soil.
2. To supply humus to the soil.
3. To supply plant food to the soil.

All legumes take nitrogen from the air and supply it to the soil; turnips take food that no other plants can obtain and decaying leave it for following crops.

What quantity of seed per acre should be used for cover crops?

Buckwheat, 1 bushel; oats, $1\frac{1}{2}$ bushels; field peas, 2 bushels; clover, 15 pounds; rye, 1 to $1\frac{1}{2}$ bushels; clover, 15 pounds; soy beans, 3 to 4 pecks; turnips, 4 pounds.

What is a good fertilizer for the orchard and how should it be applied?

Barn-yard manure is the best that can be used. Spread it uniformly over the entire orchard, using one load to every three trees. Never pile manure around the trees.

If barn-yard manure is not available, what commercial fertilizers may be used for the orchard?

If a legume is used as a cover crop, the following makes an excellent additional fertilizer: one part of muriate of potash to $1\frac{1}{2}$ parts of ground bone. If no legume is used, add 1 part of nitrate of soda to the above.

Is fertilizer for the orchard necessary?

Experiment stations disagree upon this point. However, if the ground is properly tilled and there is a cover crop which is allowed to die and rot on the field, no other fertilizer will be necessary, unless the land is very light. The theory that orchards should be heavily fertilized in order to yield is a mistake. The roots go deeply into the ground and come in contact with a vast amount of plant food. Apples are largely made up of water and do not require so much other plant food as was formerly supposed.

When setting out a new orchard, what varieties shall I plant?

Each one must decide this for himself. First, find out what varieties do best in your locality. Avoid the untested, new varieties. Most nursery catalogs advertise a bewildering number of varieties; but it is safe to say that not more than a dozen of them would prove profitable to you.

How should young trees be cared for when first received from the nursery?

Set them out as soon as possible. Do not expose them to the hot sun. If they are not to be set out at once, place the roots of the trees in a trench and cover them with fine, moist earth.

In setting out an orchard, how far apart should the trees be placed?

From 35 to 50 feet, according to variety. Greenings may be set closer than Baldwins. Forty feet is a good average.

Give rules for setting the trees.

1. Trim off all broken ends of roots.
2. Dig a hole large enough for the roots to lay straight and deep enough to set the tree two inches deeper than it was in the nursery. The depth in the nursery may be noted by the color of the bark.
3. Spread fine loamy soil over the small roots and press it down.
4. See that no open air-spaces are left under the roots.
5. Tramp the soil above the roots down, but leave it loose on top.
6. Remove at least three-fourths of the top of the tree, otherwise, since nearly all the roots are gone, the leaves will dry the tree to death.
7. If the roots are dry (which should never happen) dip them in water before setting.

At what age should trees be planted?

One-year trees receive less shock from transplanting than two-year trees, and come into bearing just as soon.

How long does it take an apple tree to come into bearing?

The time differs with different varieties. As a rule, apples that ripen early come into bearing early and vice versa. The Bismarek will sometimes bear the second year after planting, while the Northern Spy has been known to wait 18 years before fruiting. Trees grown on well-tilled land will bear much sooner than those raised on sod.

Give a rule for computing the number of trees to the acre.

Multiply the distance in feet between the rows by the distance the trees are apart in the rows and the product will be the number of trees to the acre. The same rule gives the number of plants or hills to the acre.

What is the most favorable location for an orchard?

On a north or northeast slope and on rather high ground. If planted on a south slope, the orchard is liable to suffer in dry seasons. All orchard land should be thoroughly surface drained and under-drained.

Mention some of the leading commercial varieties of apples.

Baldwins, Spys, Kings, Greenings, Gravenstein and Wealthy.

What are some of the early varieties?

Sour: Red Astrachan, Duchess of Oldenberg, Striped Harvest, Yellow Transparent, Fameuse.

Sweet: Golden Sweet, Sweet Bough.

For kitchen use and eating "out of hand" the Sweet Bough, Fameuse and Red Astrachan make a combination that is hard to beat. McIntosh Red and 20-ounce Pippin would make a valuable addition for late fall.

What method is used by some orchardists to prevent the trunks of the trees from splitting?

The main limbs are held together by living wood braces. When the tree is young, sprouts on the sides of the branches a short distance above the crotch are grafted together and firmly held in place. In a short time they grow into a strong brace and will hold the limbs in place, however loaded the tree may be with fruit.

What birds feed on the larvae and eggs of the apple pests?

Nut hatch, chickadee, woodpecker and a few others. Encourage the birds to work for you. Never fire a gun in the orchard.

How may further decay be prevented, if the tree has a rotten spot in trunk or limb?

Remove all the rotten wood, disinfect with corrosive sublimate, 1 part to 1,000 parts of water, and fill with cement. In lieu of the corrosive sublimate solution, common Bordeaux mixture may be used. If the cavity is large, use stones and fill in with cement around them.

Will hogs or sheep benefit the orchard?

Hogs will benefit the orchard, unless in their search for grubs, they uproot the trees. Sheep, turned into the orchard after the crop is harvested, will improve it.

What care should be taken by those who pick the apples?

Care should be taken not to break the short fruit-bearing twigs. The next year's crop may be almost totally destroyed by carelessness in this regard.

ORCHARD DON'TS.

- Don't neglect to prune, spray and cultivate.
- Don't spray while the trees are in full bloom.
- Don't prune old orchards too much the first year.
- Don't try to raise apples on wet soil.
- Don't prune with an axe.
- Don't cut off the lower limbs.
- Don't leave stubs.
- Don't use dull tools.
- Don't climb the trees, use a ladder.
- Don't fail to cut the highest branches.
- Don't omit painting all wounds over an inch in diameter.
- Don't prune in the fall if your winters are long and cold.
- Don't prune when the wood is frozen.
- Don't leave limbs that cross and rub.
- Don't prune young trees too hard.
- Don't expect to do in one year what has been neglected for ten.
- Don't hurry in pruning old trees.
- Don't let a tree be lop-sided.
- Don't fail to cut the under side of large branches first.
- Don't omit pruning the center of the tree.
- Don't allow the prunings to stay in the orchard, burn them.

WEEDS.

What is a weed?

There are several definitions of a weed, viz.: "A plant out of place"; "Any injurious, troublesome or unsightly plant that is at the same time useless, or comparatively so"; "A plant that interferes with a farmer's crops."

Why are weeds injurious?

1. They absorb water from the soil and lessen the supply for useful plants.
2. They use up the plant food which useful plants need.
3. They shade, crowd and choke out useful plants.
4. They increase the cost of all operations.
5. They may interfere with the profitable rotation of crops.
6. Some weeds are poisonous to stock.
7. Milk is often tainted by cows eating such weeds as Wild Garlic or Stink Weed.
8. Weeds often harbor and favor the development of injurious insects and fungus diseases.
9. Weed seeds decrease the value of seed grain, clover, grass and alfalfa seed.
10. Weeds detract from the value of a farm. No one will buy a weedy farm when he can get a clean one at the same price.

How are weed seeds distributed?

1. By the wind. Many seeds have light silky hair attached to them so that the wind can catch them easily; as, dandelion, Canada thistle, etc.
2. By water. Some seeds may be carried a thousand miles by water without injuring their vitality. The common Speedwell and Ragweed are often distributed in this way.
3. By birds and animals. "It is estimated that about 10% of all flowering plants possess seeds that are dispersed by means of barbed or cleaved processes." To this class belong the Beggar Ticks, Burdock, etc. Other plants, such as Mistletoe and Meadow Saffron, exude sticky substances that cling to birds and animals. Seeds often pass through the stomachs of birds or animals without being digested or having their vitality impaired.
4. By man. Along railroad tracks, in all kinds of packing, in barnyard and stable manure weed seed are lodged and distributed. Where animals are fed weeds take root and flourish. When implements are transferred from one field to another they frequently carry seeds in dry dirt. This is dislodged and the seeds take root and grow. Many of the most injurious and troublesome weeds of America came with seeds from foreign countries.

How are weeds classified?

1. Annuals, which germinate, bloom, fruit and die in one season.
2. Biennials, which fruit the second year and then die.
3. Perennials, which last from year to year, blooming and seeding annually.

How may perennials be divided?

1. Those with underground creeping stems; as, Canada Thistle, and Quack grass.
2. Those with roots that do not spread under ground; as, Chicory and Plantain.

Mention some of the principles of weed eradication.

1. Do not let weeds go to seed. Cut those on the roadsides, headlands, in waste places, in fence corners and in pastures.
2. Remember that the best time to get rid of weeds is before they are firmly established.
3. Sow only pure seed. Foul seed is dear at any price.
4. Be careful in harrowing weeds with perennial underground roots that the short broken pieces of roots are not dragged all over the field. Every joint will start a new plant.
5. See that the separator is cleaned before being brought upon the farm.
6. Sheep and goats will eat and check weeds that can often be destroyed in no other way.

Mention the different methods of weed eradication.

1. Rotation of crops.
2. Hoed crops.
3. Summer fallowing.
4. Early after-harvest cultivation.
5. Seeding down.
6. Pasturing sheep.
7. Smothering.
8. Hand Pulling.

Why does rotation of crops help to check weeds?

Certain kinds of weeds seem to flourish best with certain crops; as, the Pig Weed, Red Root and Barn Grass with corn and potatoes. When a different crop is placed upon the same ground these are checked.

Give the rule for fighting weeds in hoed crops.

Begin hoeing and cultivating before the roots are well established; otherwise the roots will be merely cut off and will immediately start again. The farmer often makes a costly mistake in thinking that his potatoes or corn do not need cultivating until the weeds are

four or five inches high. Going through them when the weeds are just peeping out of the ground is as effective as four times after the weeds are well established.

What may be said for or against the practice of summer fallowing as a means for destroying weeds?

Summer fallowing is one of the most effective means for eradicating weeds. The objections to it are that it destroys humus and one year's crop is lost by it. It renders, however, a larger amount of soluble plant food available and assists in conserving moisture for the next year's crop. In Washington and some of the other north-western states where a crop is raised only every other year, the land being harrowed one year, it is said the crop is equal to what would be obtained if one were raised each year. Thus the cost and labor of putting in and harvesting one crop is saved.

What weeds may be destroyed by early after-harvest cultivation?

Plowing shallow immediately after a harvest destroys the winter annuals; as, False Flax, Cockle and Wormseed Mustard. Other weeds are set back.

What may be said in favor of seeding down as a method of destroying weeds?

Fields overrun with some kinds of weeds, particularly annuals, may be cleaned by seeding to grass. This method has the advantage of little expense and labor. The hay should be cut early before the weeds are mature.

How may weeds be smothered out?

Sow some quick growing crop, such as rape or buckwheat. These crops will quickly cover the ground and, in their weakened condition, the weeds will be smothered out.

How may quack-grass be destroyed?

As soon as the crop is harvested plow lightly and harrow. If the roots are present in large quantities, they may be raked up with a hay rake and burned. Harrow frequently during the remainder of the season. If the season is dry, nearly all the roots will be destroyed. In the spring plant corn or potatoes and keep the grass down by hoeing and cultivation. This will destroy the roots that have survived the other processes. Canada thistles may be destroyed in the same way.

Is it advisable to sow quack-grass seed for pasture?

"Were it not for its weedy character, quack-grass would be a valuable forage plant. It makes fair hay and is relished by cattle when pastured; but because it so readily becomes a weed, it is unsafe to plant."—Cornell Leaflet.

How may sorrel be eradicated?

Sorrel indicates poor, sandy, or gravelly soil. It prefers sour soil, hence liming and manure is the best remedy.

How may wild parsnip be eradicated?

Wild parsnips and wild mustard, like any of the other biennials, may be killed out by preventing them from going to seed.

What important measure can a farmer take to prevent weeds?

He can be sure that there is no weed seed present in his seed grain. Very little study will be necessary to enable the farmer to identify foul seeds. A common reading glass or small microscope will be necessary for their examination. Farmers' Bulletins 260 and 382 will assist in identifying different varieties. A good fanning mill will be necessary for the recleaning of seeds before sowing.

Is spraying a good method of eradicating weeds?

Spraying with a solution of 100 pounds of iron sulphate or 12 pounds of copper sulphate to 50 gallons of water will kill wild mustard and some other weeds. A machine should be used that will give fine spray under considerable pressure. Fifty gallons of the solution will be sufficient for one acre. For killing weeds in walks a 2 per cent solution of sodium arsenate, about eight gallons to the square rod, may be used.

WEED DON'TS.

Don't let the weeds get the start of you.

Don't sow weedy seed.

Don't fail to cut the weeds along the sides of the road and in fence corners.

THE PASTURE.

Does the average farmer pay enough attention to the improvement of his pasture?

He does not. Swales, waste places and unprofitable meadows are often turned into pasture with little or no attempt to improve their condition. The pasture should be the most profitable land on the farm. It should not only yield plenty of grass, but such a variety as will afford the stock a balanced ration. The drainage of a piece of wet pasture land, or the substitution of a good sod of mixed pasture grasses for the red top and white grasses of the pasture are matters of vital importance to the farmer.

Suggest some good seed mixtures for a permanent pasture.

No. 1.	No. 2.
10 lbs. timothy,	5 lbs. timothy,
4 lbs. red clover,	6 lbs. red clover,
3 lbs. alsike clover,	4 lbs. alsike clover,
2 lbs. white clover,	4 lbs. Kentucky blue grass,
3 lbs. Kentucky blue grass,	2 lbs. tall meadow fescue,
2 lbs. tall meadow fescue,	3 lbs. orchard grass,
2 lbs. alfalfa.	2 lbs. red top.

What is a good mixture for wet, sour land?

Five pounds of timothy, 5 pounds of red top, 5 pounds of alsike clover and 3 pounds of white clover.

What is the most important pasture grass, and why?

Kentucky blue grass. It spreads from the roots without going to seed; it starts early in the spring; it is much relished by all kinds of stock. Although pure seed is hard to get and somewhat costly, no pasture should ever be without it. Timothy, at its best, is good for only about four years, and should be sown in pastures only to supply feed while the other grasses are getting started.

Should a field sown with a permanent pasture mixture be mowed before turning into pasture?

It would be best to mow the grass for hay at least once.

How may an old pasture that can not be plowed be improved?

Lime it, if sour. Spread a coat of manure over it with a manure spreader. Sow one of the pasture seed mixtures on places where the grass is thin as early as you can get on the ground.

Can sodium nitrate be profitably used on an old pasture?

Yes; if the land is in need of nitrogen. Use about 200 pounds to the acre. A trial test of a half acre should demonstrate whether it would be profitable to continue the treatment.

Will sheep improve a pasture?

A few sheep in a weedy pasture will much improve it. They will eat weeds that cows will not touch, thus giving the grasses a better chance to grow. Too many sheep will injure the pasture by close cropping of the grasses.

Will mowing the pasture with a machine improve it?

Mowing the pasture twice a year will help to check the growth of weeds and prevent many of them from going to seed. The cutting should be high in order not to injure the grasses.

PASTURE DON'TS.

Don't pasture too early in the spring.

Don't turn a poor meadow into pasture.

Don't neglect to fence off the poorest part of the pasture and fit it with a permanent pasture mixture.

Don't let the weeds in the pasture go to seed.

Don't fail to do a little to improve the pasture every year.

FORESTRY.

What is the average price per M. feet obtained at mills for all of the principal New York woods?

White Oak	\$46.25	Birch	\$30.07
Red Oak	38.49	Elm	28.37
Chestnut	28.56	Basswood	27.36
Sugar Maple	27.07	White Pine	27.70
Beech	20.54	Spruce	21.31
Cherry	46.22	Hemlock	19.82
Hickory	43.03	Yellow Poplar	40.47
Ash	38.49		

In establishment of a Farm Woodlot Plantation which is best pure or mixed planting?

Owing to the diversity of the uses for wood on the farm, the mixed planting is to be desired as some of our quick growing, light-wooded species can be utilized for fuel while the heavier hard woods may be utilized for repairing the farm tools, etc. The mixed stand has advantage over the pure stand also in taking advantage of the different soil qualities. The moisture demanding species do better on the low lands and the other species do better on the drier locations. Mixed species tend to produce cleaner timber on account of the fact that the trees have a tendency to prune each other. Next the damage due to outside danger such as insect pests, wind storms, etc., on account of the fact that a great many of the trees will not be subject to the same insect pests as some others and also due to a difference in the root constructions of the trees in a mixed stand. The crowns of the different species will more thoroughly utilize all the atmospheric space than will a stand of only one species. This may also be said to be true regarding the matter of soil protection. The forest floor will be more amply protected from the direct rays of the sun and the eroding action of heavy rains far less. For small farm woodlots a mixed plantation is far more preferable. Forest conditions are established quicker with mixed planting than in pure plantings.

What is the best method of storing over winter black walnuts and similar forest tree seeds?

In the storage of any forest tree seeds it is well to mimic nature. Those seeds that fall naturally to the ground such as our nut seeds, acorns, etc., should be kept in a moist place, fairly even temperature over winter. The best method is to pit them. This is done by digging a trench of a size to accommodate easily the amount of seed on hand as in the case of black walnut. Spread a layer of black walnut over the bottom of the trench; cover this with clean sand of the same thickness; then another layer of nuts and another layer of sand until the nuts are all stratified in this way. Care should

be taken that this pit is located where there is good soil drainage preferably where the direct rays of the sun will not warm up the soil too early in the spring as on a north slope or in the shade of some buildings.

What is the best way to propagate willows and poplars?

Poplars and willows are among the easiest of our tree species to be propagated vegetatively or by cuttings. Theoretically any plant may be propagated by taking a cutting and rooting it. The best way to make cuttings for poplar or willow is by making cuttings from the previous year's growth 8 to 10 inches long about the size of a large lead pencil. The best season to make these is in February and March. These cuttings are tied into bundles 25 to 50 in each bundle and are placed tops down in a box filled with moist sand or moist sawdust. The base ends which have been turned up will slowly callous over and small rootlets will appear. The rapidity of this development depends a great deal on the amount of heat. Cuttings should not be forced too rapidly. After the soil is ready the cuttings should be planted on the proposed areas. As soon as the callous is well developed care should be taken that the cuttings are placed in the ground at a slight angle and that no more than 1" or 1½" of the tops shows above the surface. Poplar and willow handled in this way will make a rapid growth.

What is a forest tree seedling?

The term seedling is applied to any forest tree during its first growing season before transplanting has been done. The height growth of seedlings of some of our trees are as follows:

American Elm	6 to 12 in.	Hardy Catalpa	24 in.
Honey Locust	8 to 12 in.	White Pine	3 in.
Sugar Maples	12 in.	White Spruce	2 in.
Black Locust	24 in.	Black Walnut	12 in.
Basswood	6 to 12 in.		

What is the best time to prune shade trees?

The best time to prune shade trees is the dormant period. Usually from November first until the first of April in this latitude. However, if the pruning is done early in winter giving away of the tissue of the wood in freezing and thawing may occur. In pruning the surface wound should be smooth and parallel to the surface of the trunk of the tree. An application of white lead or some other good paint should be made immediately. Care should be taken in the development of the callous covering this wound that it develops evenly over the entire surface. Do not prune trees in spring on account of bleeding. Do not prune trees in dry mid-summer on account of defoliating.

Having a stand of mixed hardwoods in a woodlot, it is desired to ascertain the number of board feet contained in the stand.

Methods used in doing this work are usually termed "cruising." There are several methods which are good. One method is to go through and first determine the least diameter which it is anticipated will be cut. Go through the stand and determine the different species by ocular estimate the number of logs which it is possible to obtain

from the tree. The contents of these logs may be ascertained by applying the Doyle rule. The Doyle rule is simple. It assumes that any log 16' long is equal in feet board measure to the square diameter reduced by 4. Thus a log 24" in diameter 16 feet long would be estimated as $24 \text{ minus } 4 \times 24 \text{ minus } 4 \text{ equals } 400$ feet board measure. If the log was 18' long instead of 16' $400 \times 18 / 16$ or 450 board feet. Other diameters and results may be worked out accordingly, thus giving the total volume of the stand.

Having on hand a quantity of white pine seed, how would you raise white pine seedlings?

In a well drained soil, white or sandy loam where the soil is in good mechanical condition in fair fertility, prepare the seed bed 4 feet wide and as long as necessary to accommodate the seed on hand. This area should be spaded or plowed at least 9" deep in the fall and thrown up to the action of the weather. The freezing and thawing will kill out a great many of the insects and tear down soil particles making it much easier to work. As early as it is possible to rake the ground in the spring the area should be raked over carefully, or if there is a large area disked and cross disked, then harrowed with a spike-tooth harrow and then raked by hand. After the area has been thoroughly raked, then it should be rolled and raked lightly. The seed should then be distributed over the surface broadcast so that there will be about one seed to each square inch. The area should then be rolled or planked lightly thus pushing the seed down into the soil the same depth to which the seed is wide. Then there should be sifted lightly over the top sandy loam of the same fertility to a depth sufficient to cover the seed. After this application a light ring of humus soil taken from underneath decaying leaves and litter in the woods, should be made. After this second application, pine seedlings or straw should be placed over the bed 5" or 6" thick. If straw is used care should be taken not to introduce grain or weed seeds. The bed should be watched and as soon as it is seen that the seeds begin to germinate the mulch or straw or leaves should be removed and a lath screen of 50% shade should be constructed over the bed. The screen may be held up by stakes 18" high. Care should be taken to protect the bed from birds. Do not leave the screen on during rains. Remove the screen every afternoon between 4 and 5 o'clock and do not place it on the bed until between 7 and 8 o'clock in the morning. In this way the bed gets the advantage of the fall of dew and has good air ventilation. At the end of the first growing season these seedlings should be from $2\frac{1}{2}$ " to 3" high. Protection for winter: Where the soil is inclined to heave with frost light mulch should be spread over the seedlings. It should be put on after the surface of the soil is thoroughly frozen and remain on until after the danger of sudden changes in temperature are past in the spring.

What is heeling in?

Heeling in is the operation in the temporary holding of tree stock from the time it has been received in shipment until it may be planted

or for the temporary holding of stock for the transplanting. A trench is dug sufficiently deep to accommodate the roots of the stock to be heeled in. A layer of seedlings are then placed in the trench, dirt is thrown over and packed down thoroughly; then another layer of seedlings are placed on the top and a little deeper than the first layer; more dirt is placed on the roots and this operation is kept up until all the seedlings are cared for. Heeling in should be done in a well-drained, shady location, preferably in soil that is easily worked. The tops should be laid toward the north as vegetative process will be retarded more than it would were the tops pointed toward the south on account of the direct rays of the spring sun.

What is the best method of treatment for preserving fence posts from decay?

Fence posts should be cut a year or a year and a half before they are actually required for use. They should be cut in the winter when the trees are in a dormant state and should be piled as soon as possible, piling in open crib form in order to thoroughly season. If they are piled in this way the seasoning will take place rapidly and they should be thoroughly dry within one year. One of the simple treatments to prevent decay is to char the base of the fence post in a band where the post when set will be at the dirt line, decay takes place more rapidly where the air and moist soil come together. This charring should be done thoroughly, at least $\frac{1}{4}$ " to $\frac{1}{2}$ ". By thoroughly charring the expense is very slight, only a matter of labor.

Another good method is to apply creosote. A thorough manner to do this is by placing the posts in a tank so that they are covered to about one half their length. Heat the creosote to a boiling point. As soon as the boiling point is reached immerse the posts in cold creosote. The hot creosote having opened up the pores of the wood and driven out the excess moisture, when the post is immersed in the cold creosote the cold oil will rush in and bathe the pores. One barrel of oil will treat about 200 posts, depending on the size and species of wood used. The cost of treatment will be about 5c each. One barrel of creosote of 52 gallons costs about \$5. Such a preservative treatment about doubles the life of our ordinary fence posts. Without further treatment than seasoning a white cedar post quartered to 6" face will last 10 to 15 years. White oak 6" round post 8 years. Ash, beech and maple 3 or 4 years; willows 6" in diameter piled and thoroughly dried 6 to 7 years.

When is the best time to clear land of small growth?

Cut during the last part of July or August. At this time plants are exhausted from their efforts to store up food, and it will be difficult for them to recuperate and start a new growth.

CEMENT AND CONCRETE.

What is Portland Cement?

Portland Cement is a finely powdered material resulting from the burning of a properly proportioned mixture of limestone and shale, or clay. In other words the materials used must consist largely of lime and clay and must be mixed chemically in proper proportions.

What is concrete?

Concrete is in reality an artificial stone made from cement, sand and broken stone or gravel. These materials are properly proportioned so as to form a dense mass, the voids of the stone being filled by the sand and the voids of the sand filled by the cement. The materials must be thoroughly mixed and a sufficient amount of water used to make a mass of a jelly-like consistency. Due to the action of water and cement it will begin to stiffen in half an hour or so, will set up in from ten to twenty-four hours, and in a month will be hard as a rock.

Mention some of the purposes for which Portland Cement may be profitably used on the farm.

Portland Cement may be used on the farm for a great variety of purposes, some of which are the making of foundations, walls and floors for houses and barns, for silos, tanks, cisterns, fence posts, walks and such work of a general nature.

How should cement, sand and gravel be mixed for walks?

For this purpose the common method is to make a base consisting of one part cement, $2\frac{1}{2}$ parts sand, and 5 parts of gravel: this is to be covered with a top coat about an inch thick made of a mortar one part cement and two parts of sand.

What proportion of cement, sand and gravel should be used for watering troughs?

The common mixture employed for this type of construction is one part of cement, two parts of sand, and three parts of gravel, the idea being to have a mixture which is rich in cement in order to make as dense a concrete as possible.

Would cement walls be the cheapest for barns or houses?

The cost of concrete construction depends largely upon the locality. In some places the sand and gravel can be obtained at very slight cost and often for the mere cartage. The cost of forms is an item for consideration, and frequently the lumber used can be employed for the construction of a building. Concrete does not require skilled labor as in the case of wood or brick work. In first cost concrete is considered more expensive than wood. However, concrete does not burn, rot, and has no cost for maintenance, and thus in the end concrete should compare very favorably with any type of construction.

Can cinders be used in place of gravel?

Cinders are used for making concrete where strength is not very important for instance, in some types of floor work cinders answer the purpose of gravel, and in foundation work where mass is the principal quality desired cinder concrete is also employed.

Will concrete harden under water?

Portland Cement is a hydraulic material, and thus concrete made of this cement will harden in water or air.

How long will cement keep?

Portland Cement can be kept practically indefinitely when it is stored in a dry place and protected from moisture and dampness. The way Portland Cement is injured in storage is by coming in contact with moisture. This of course results in its hardening. It is sometimes reconditioned that is, broken up and finely pulverized by passing through a screen, but best results cannot be expected from reconditioned cement.

What is the quantity of cement in a barrel?

One barrel of cement holds 3.80 cubic feet and consists of four bags.

What kind of sand should be used for making concrete?

It is particularly important in making concrete to use a good quality of sand and gravel. The making of concrete is essentially a manufacturing operation, and it can be spoiled as easily by poor aggregate as by poor cement. The sand should be coarse, hard, and clean, and the gravel clean and durable. A very small percentage of vegetable matter will render aggregate unfit for use. That which contains mica in any appreciable quantity should also be discarded and not used for the purpose of making concrete. Sometimes the grains of sand are coated with clay which prevents the obtaining of good results, as cement cannot unite the grains of sand when they are in such a condition. Sand and gravel which contains dirt or loam can be easily washed according to the instructions given in "Concrete Construction about the Home and on the Farm," published by the Atlas Portland Cement Company.

Can sea water be used in making concrete?

It is not advisable to use sea water in mixing concrete on account of the chemicals contained therein.

Can concrete be made waterproof?

By the selection of good, clean sand and gravel, by making the concrete of a maximum density, by using a mix of rather wet consistency—that which will just flow sluggishly—and by placing the concrete in one continuous operation, it is possible to obtain a concrete which will be water-tight under all ordinary pressures.

Is concrete affected by fire?

Under fire concrete has proven very serviceable and in fact is one of the best fireproof materials known. It is used largely for this purpose, such as encasing columns and beams in fireproof construction work. It is a very good non-conductor of heat and from one to two inches of concrete or mortar has been found to protect the material underneath. In some cases where the surface has become slightly cracked and checked under severe heat it has been found that this has affected the concrete to a depth of not more than two inches. Concrete can be depended upon to resist all ordinary fires.

PERTINENT QUESTIONS FOR FARMERS' WIVES.

What is the first necessity in rural sanitation?

Plenty of pure water.

What is the safest way of disposing of household waste?

A septic tank, (which any farmer can construct) to take care of the waste from the laundry, kitchen, lavatory and toilet. Table wastes not suitable for the farm animals should be burned or buried.

Why are flies dangerous as well as annoying?

They breed in filth and never "wipe their feet." They carry typhoid and other germ diseases from excreta and other dangerous sources to the food on the table and the baby's bottle.

Is night air dangerous?

It is not, because at night it is the only air we have, except the impure air we have locked up in our sleeping rooms. In the cities night air is more free from dust and germs than in the daytime during traffic and when factories are throwing off smoke and gases. Air that is warmed by the sun is better. The sun should penetrate every room in the house. Sun will destroy germs. Sleeping out of doors is getting very common and the practice is warding off pulmonary diseases and keeping us free from colds.

How does ventilation affect health?

Poor ventilation means impure air and impure air affects health. Every house should be constructed so there may be an escape for the impure air and an inlet for supply of fresh air and still be comfortable. Cold air does not always mean fresh air. Cloth windows break the direct force of the draft and protect the occupants of a room. A large draft striking the entire body is not as dangerous as a small draft striking a small portion, such as the back of the neck.

What types of disease are strictly preventable?

Those spread largely through intestinal discharges as, typhoid, etc. Those through discharges from the throat and nose as, tuberculosis, common colds, etc. Insect borne diseases, like yellow fever, etc. Miscellaneous diseases; food and mouth diseases. ..

Is an unpleasant odor a menace to health?

Gases that are thrown off are waste products which pollute the air thus making it impure. They are a menace to health.

Is there a safe headache remedy?

Headache is not a disease, but a symptom. The cause should be removed rather than the pain deadened. Headache remedies are largely coal tar products which depress the heart. They tend to draw the blood from the brain and overwork the heart. Their persistent use causes insanity.

What are some of the rules of good health?

Plenty of pure water inside and outside the body. Pure food, exercise, fresh air night and day. Thinking well thoughts. Forgetting ourselves in serving others.

What is the difference in effect between a hot and cold bath?

The cold bath should be taken after exercise or after a hot bath when the body is warm. A cold bath should not be used by one who cannot get a healthy glow after the rub. The hot bath opens the pores of the skin. It should not be taken just after a meal or when brain work is to be done. To some the hot bath is very debilitating while it generally tends to produce sleepiness.

Should a housekeeper "take time off" every day?

She should rest frequently. The tread mill fashion of working kills the imagination and affects the nerves. By stopping to relax several times a day, more can be accomplished in a given time. Large corporations are trying this out with their employes purely from an economic standpoint and it pays *them* in dollars and cents. It will pay the housekeeper because she will have more time to "make a real home." Housekeeping is not always "homemaking."

What is the best substitute for mother's milk?

Cow's milk given under the direction of a trained nurse or a physician. Cow's milk contains more protein than the mother's milk and should be diluted with water.

Should children be allowed to drink coffee or tea?

Children should never be allowed tea, coffee, beer or other stimulants.

What constitutes a good school lunch?

Egg, meat or peanut butter sandwiches, bread and butter and jelly, apples, oranges, custards, cookies and pie occasionally. Nuts and raisins, a few pieces of candy. Candy and nuts should never be given on an empty stomach. If children are allowed pure candies in moderate amounts at the right time, they will not unduly crave and buy the cheap and adulterated kinds found at the "corner grocery." Homemade candies are best. Children must have a certain amount of sweet in their diet.

Is it safe to give children patent medicines?

Most emphatically no. No remedies should be given except under the direction of the family physician, except the simple home remedies. The so-called soothing syrups contain opiates and are deadly in their effect. Patent medicines of all kinds for children and adults should be avoided like a plague.

What are the general rules that govern the cooking of (a) meats, (b) eggs, (c) starchy foods, (d) vegetables?

(a) Meat and eggs are classed as protein foods and are therefore subject to the principles of protein cookery. Meat and eggs should not be cooked at a high temperature, as high temperature will toughen the protein and render it less readily digested. Meat is composed of muscle fibres held by connective tissues. The muscle fibres toughen when boiled, the connective tissue becomes soluble and is then known as gelatine. Generally the more the connective tissue, the tougher the meat. Thus if tough cuts are cooked a long time below the boiling point the fibres become tender and the connective tissue is softened. Tender cuts of meat such as beef steak, are seared in order to toughen the outside of the meat and thus retain the juices.

(b) Eggs being a protein food should be cooked at the boiling point. Soft cooked and hard cooked eggs are more palatable and easily digested if cooked in water just below the boiling point than if cooked a shorter time in boiling water. Fried eggs, scrambled eggs and omelets should be cooked at a low temperature. The same principle applies to the making of custards. If they are subjected to high temperatures the protein coagulates, toughens and curdles.

(c) Starch is made up of many tiny grains which do not dissolve in cold water but which absorb water, swell and burst when they are subjected to moist heat. In this form it is easily digested.

Starchy vegetables, white sauces and cereals should be cooked in such a way that the starch grains swell and burst and a palatable flavor is developed. This requires continued cooking by moist heat.

(d) All vegetables belong to one of two classes. They are either strong or mild juiced. The strong being onions and cabbage and these should be cooked in liberal amounts of water in an uncovered pan. The mild juiced should be cooked in a small quantity of water in a covered pan. Vegetables should not be overcooked as they are unpalatable and develop strong flavors which may be very irritating to the digestive tract.

Is it desirable to use commercial canning powders?

It is undesirable to use canning powders. While the occasional use of vegetables canned with these powders may not show immediate ill effects, the continued use may result in serious effects upon the health. It is entirely possible to keep all vegetables and fruits indefinitely by sterilization, therefore why run a risk by using powders?

What foods are good substitutes for meat?

Milk, eggs, cheese, nuts, legumes.

What is the test of a good broom?

One that is "even" enough to stand alone when placed on the floor. It should have a smooth, straight handle and should be of medium weight.

Is there a practical dish-washing machine for the private home?

The majority are too expensive and only few are practical. The Fearless Dishwashing Machine Co., Rochester, N. Y., makes a good one, but it costs \$30. With a large family it might prove a good investment.

Are paper towels, paper dish cloth, etc., a good investment?

Not as an investment. They cost too much. Paper towels are very convenient in the kitchen and save some washing. From a sanitary point of view they are desirable for rural schools, railway stations and public lavatories. Public towels should never be used. They are disease carriers.

What are some of the best finishes for kitchen walls and floors?

Paint makes the best finish for a kitchen wall where steam is inevitable. The walls are easily wiped off. The kitchen should be painted a bright cheerful color. A dark and dingy kitchen is an abomination to the one who has to spend so many hours in it. Linoleum makes the best floor covering. It has a certain amount of "give" to it that the bare floor does not have. It is easier to stand on while at work. Rubber heels are excellent to prevent the continual jar which affects the head and spine.

Are vacuum sweepers better than the ordinary carpet sweeper?

They should hardly be compared, as we cannot get along without the ordinary carpet sweeper for "brushing up" a little every day. The vacuum cleaner is indispensable for housecleaning as it saves taking up carpets and stirring up dust all through the house. It is a labor saving device and every housekeeper should have one.

Can "dustless dusters" be made at home?

A good duster can be made by using the ordinary machine oil which is used for the farm machinery, and "cutting" it with kerosene. Saturate cheese cloth with this and you have a cheap and satisfactory duster. Some prefer to buy the black cheese cloth.

MAKING MAPLE SUGAR.

In what states may maple sugar be made?

In all the New England and the Middle States.

What trees supply sap for maple sugar?

Only the rock, or hard maple. Never tap the soft maple; it may be distinguished by the color and shape of its bark.

What kind of sugar utensils should be used?

Use metal spouts and the best tin buckets. Covered buckets are not necessary. The farmer may build his own arch, using stones or fire brick, or he may purchase an arch already to set up. He can use an evaporator or a sheet-iron pan.

What are the secrets of good sugar making?

1. Fresh, clean sap; 2. rapid boiling; 3. frequent syruing off. The buckets and all other utensils must be absolutely clean and sweet. The sap should not be allowed to stand in the buckets longer than twenty-four hours. Twelve hours would be better. Strain the sap when it is gathered and again when it is run into the store tub. It is not what is put into maple syrup that makes it white, but what is kept out. The darker the sugar, the more impure it is. Maple syrup, if the process of making were perfect, would be as colorless as the sap from which it is made. When the sap is put into the pan it must be kept boiling vigorously until it is syrup. Long boiling, even if the sap is kept clean, will cause the color to become red. If light colored syrup is wanted, syrup off at least every twelve hours.

What should be done to the sap while it is boiling?

With a long-handled skimmer remove every particle of scum or dirt that appears on the surface.

What should be done with the pan after syruing off?

The pan should be thoroughly washed and rinsed before more sap is run into it. This may seem a waste of time, when more sap is waiting to be boiled; but light-colored sugar can not be made without doing it.

What may be done with the sweetened water obtained by washing the pan?

It can be made into vinegar. Let settle and strain into a clean cider or whiskey barrel which should be left with the bung hole open, covered with a fine wire screen.

How is one to know when it is time to "syrup off?"

By the behavior of the syrup when poured off the edge of a dipper or skimmer. When it no longer runs off in small drops, but seems thick and viscid, it is ready to "syrup off."

After syruing off, what must be done to prepare the syrup for the market?

Place in a smaller pan and boil to proper thickness; strain through felt cones (made on purpose) or good wool (flannel) to take out the "lime" or "sugar sand;" let it cool and settle and can in self-sealing tin cans that hold a gallon each. Fill the cap-neck even full so as to exclude all air and then screw the cap down tight with small gas pliers. Keep in a cool, dark place and it will hold its rich maple flavor well for a year or more.

If it is desired to make the sugar into cakes, the syrup is boiled until it thickens and the wax breaks. Then it is taken off, stirred rapidly and poured into moulds.

What part of the season is the best for maple sugar making?

The first runs make the best sugar. In order to be good sugar weather it must freeze during the night and thaw days. Whenever there is a protracted warm spell the buckets should be laid down to drain.

What is the cause of the rock candy so often found in the bottom of the cans of maple syrup?

If syrup is boiled so thick that it weighs more than eleven pounds to the gallon, the legal weight, it is apt to crystallize at the bottom into clear rock candy or into granulated sugar. In glass cans that stand in the light the granulated sugar is more often formed. Keep your syrup in a cool place not exposed to the light.

Give rule for tapping the trees.

It is better not to tap trees that are under ten inches in diameter. If the trees are two feet or more in diameter, two buckets may be used to a tree. In tapping use the metal, flanged spouts that require a half-inch bit. The hole should be bored about two inches deep, slightly slanting. When the season is well advanced it may be slightly deepened. In "tapping over" do not bore new holes in the trees.

PROFITABLE POULTRY RAISING.

How may the different varieties of chickens be classified?

1. The egg breeds. These mature early, begin laying when quite young, are nonsitters and light of weight. Leghorns, Minorcas, Hamburgs and Ciecilian Buttercups are representatives of this class. They lay white eggs.

2. The general purpose breeds. These include the Plymouth Rocks, Wyandottes, Orpingtons, Rhode Island Reds and a few others. They are heavier than the egg breeds and do not mature quite so early. They are excellent table fowls and good layers. They are good sitters and good mothers and are the best for the farmer who raises only a small flock. They lay light brown eggs.

3. The meat breeds. The Chochins, Brahmas and Langshans are the best representatives of this class. They are the largest of the different breeds and are considered poor layers. They are very docile, easily tamed and stand close confinement. They are persistent sitters.

4. The fancy breeds. These include the Bantams, Games (except Indian Games), Polish, Frizzles and Silkies. They are bred for show purposes only and are unprofitable for the farmer or general poultryman.

Which of the egg breeds is the best for egg production?

More than ninety percent of the successful poultrymen breed the White Leghorn for egg production.

How many eggs per hen may be expected from the egg-producing breeds?

This will, of course, depend upon the poultryman. The average egg production of farm-yard fowls is about 70. No doubt there are many flocks that do not average more than 20 eggs each. However, when a flock is properly selected, housed and fed, it should average at least 120 eggs for each hen. Many strains have been developed that produce more than 200 eggs each, per year. The record of 303 eggs, is held by a hen owned by the Oregon Agricultural College.

Which is the best of the general-purpose breeds?

There is very little choice between them. Each has its advocates. The Wyandottes are not quite so persistent sitters as the Plymouth Rocks, which make them a favorite with some.

By what method should chicks be hatched?

All successful poultrymen now use incubators. While they require close attention, their many advantages are obvious. By their use the poultryman does not have to depend upon the caprices of the hen; large numbers of chicks may be hatched at one time and perfect freedom from lice be attained:

What care should be given to the young chicks when hatched?

During the first forty-eight hours of a chick's life it requires a comfortable, even temperature, sleep and, toward the end of the period, a drink of water with the chill removed. Care should be used to see that the chicks do not get wet at the drinking fountain or drink water that has become foul or stale. The floor of the brooder should be covered with coarse, sharp sand, over which is scattered chaff or straw litter.

How should the young chicks be fed?

If hatched under a hen in warm weather and the hen is allowed to run, moistened corn meal may be fed with good results. The chicks will obtain the meat balance from insects and bugs. They must always have plenty of pure water. If the young chicks are hatched too early to be placed on the ground, the problem of caring for them is a more serious one. They must be supplied with a well balanced ration with sufficient grit for digestive operations. The New York State College of Agriculture, at Cornell University, gives the following rations and directions for feeding chicks to maturity:

THE RATIONS

MIXTURE No. 1

- 8 lbs. rolled oats
- 8 lbs. bread crumbs
- 2 lbs. sifted beef scrap
(best grade)
- 1 lb. bone meal

MIXTURE No. 2

- 3 lbs. wheat (cracked)
- 2 lbs. cracked corn (fine)
- 1 lb. pinhead oatmeal

MIXTURE No. 3

- 3 lbs. wheat bran
- 3 lbs. corn meal
- 3 lbs. wheat middlings
- 3 lbs. beef scrap
(best grade)
- 1 lb. bone meal

MIXTURE No. 4

- 3 lbs. wheat (whole)
- 2 lbs. cracked corn
- 1 lb. hulled oats.

MIXTURE No. 5

- 3 lbs. wheat
- 3 lbs. cracked corn

THE METHOD.

1—5 DAYS

Mixture No. 1, moistened with sour skimmed milk, fed five times a day: Mixture No. 2 in shallow tray containing a little of No. 3 (dry) always before chicks. Shredded green food, and fine grit and charcoal scattered over food.

5 DAYS—2 WEEKS

No. 2 in light litter twice a day. No. 3, moistened with sour skimmed milk, fed three times a day; No. 3 (dry) always available.

2—4 WEEKS

As above, except that the moist mash is given twice a day.

4—6 WEEKS (or until chicks are on range)

Reduce meals of moist mash to one a day. Mixture No. 4 in litter twice a day; dry mash always available.

TO MATURITY:

No. 3 and No. 5 hopper fed. One meal a day of moist mash if it is desired to hasten development.

Further Directions.

Provide fine grit, charcoal, shell and bone from the start.

Give grass range or plenty of green food.

Have fresh, clean water always available.

Feed only sweet, wholesome foods.

Avoid damp and soiled litters.

Feed moist mash rather sparingly.

Keep chickens active.

Disinfect brooders frequently.

Test all beef scrap before feeding.

Cracker crumbs may be substituted for bread crumbs when bread is not available.

THE CORNELL RATIONS FOR LAYING HENS.

The following whole grain mixture is fed morning and afternoon in a straw litter:

By Weight		By Measure	
Winter		Winter	
60 lbs.	wheat	32 qts.	wheat
60 "	corn	36 "	corn
30 "	oats	30 "	oats
30 "	buckwheat	20 "	buckwheat

The following dry mash is fed in a hopper kept open during the afternoon only:

By Weight		By Measure	
Winter and Summer		Winter and Summer	
60 lbs.	corn meal	57 qts.	corn meal
60 "	wheat middlings	71 "	wheat middlings
30 "	wheat bran	57 "	wheat bran
10 "	alfalfa meal	20 "	alfalfa meal
10 "	oil meal	8 "	oil meal
50 "	beef scrap	43 "	beef scrap
1 "	salt	1½ "	salt

The fowls should eat about one-half as much mash by weight as whole grain. Regulate the proportion of grain and ground feed by giving a light feeding of grain in the morning and about all they will consume at the afternoon feeding (in time to find grain before dark). In case of pullets or fowls in heavy laying, restrict both night and morning feeding to induce heavy eating of dry mash, especially in the case of hens. This ration should be supplemented with beets, cabbage, sprouted oats, green clover or other succulent food, unless running on grass covered range. Grit, cracked oyster shells and charcoal should be accessible at all times. Green food should not be fed in a frozen condition. All feed and litter used

should be strictly sweet, clean and free from mustiness, mould or decay. Serious losses frequently occur from disease, due to the fowls taking into their bodies, through their intestinal tract or lungs, the spores of the fungus causing moulds.—Dept. of Poultry Husbandry, Cornell University.

Contest Rations.

At the egg contest at Storrs, Conn., the following grain mixture was fed:

Coarse wheat bran	200	pounds
Cornmeal	100	"
Gluten feed	100	"
Standard middlings	75	"
Fish scrap	30	"
Beef scrap	30	"
Low grade flour	25	"

There were little boxes holding grit, shells and charcoal which the hens took as they liked. There was also provided a "scratch grain" made up as follows:

Cracked corn	60	pounds
Wheat	60	"
Heavy white oats	40	"
Barley	20	"
Kafir corn	10	"
Buckwheat	10	"
Coarse beef scrap	10	"

OTHER GOOD FEEDING MIXTURES.

No. 1.

Dry Mash.

Corn meal	10	pounds
Wheat bran	10	"
Wheat middlings	10	"
Oil meal	5	"
Beef scrap	5	"

No. 2.

Young Chicks on the Range.

Boil rice until well done. When thoroughly cooked, mix it with one-half the quantity of white corn-meal. Add cold water sufficient to make a good soft dough. Grease a baking tin, spread this dough thinly over the pan, and bake until well done. Soften with cold water and feed the chicks on this mixture. It will cause them to grow surprisingly fast and very strong. This food is said to be, also, a good preventive of bowel troubles.

No. 3.**Dry Feeding.**

Cracked corn	200 pounds
Whole wheat	360 "
Oats	130 "

Scatter in the litter morning and at noon to induce exercise

No. 4.

Cracked corn	15 pounds
Wheat	10 "
Oats	5 "

Use with this the following dry mash:

Corn meal	8 pounds
Wheat middlings	12 "
Wheat bran	8 "
Meat scraps	8 "
Oil meal	2 "
Alfalfa meal	2 "
Fine charcoal	1½ "
Salt	1½ oz.

No. 5.

Cracked corn	4 pounds
Wheat	2 "
Oats	1 "

Use with this the following dry mash:

Corn meal	3 pounds
Wheat bran	2 "
Meat scraps	2 "
Wheat middlings	1 "

No. 6.

Cracked corn	1 bushel
Whole wheat	1 "
Buckwheat	1 peck
Oats	½ bushel

Feed with this the following mash:

Bran	200 pounds
Corn meal	100 "
Middlings	100 "
Ground oats	50 "
Ground bone	10 "

Give directions for providing rape?

Fit the ground as if for wheat, sow the rape broadcast and cover lightly. In six weeks it will be ready for the hens. The writer once divided his hen-yard into two parts, sowing both to rape. While the hens were in one part, the other was closed. Rape will come up again, if not eaten down too closely; so by alternating the two parts, he kept his hens supplied with green food all summer.

although not on free range. As soon as the hens were turned into the rape, they consumed only about one-half the usual amount of dry rations and their egg production was increased. It seems that few poultrymen realize the importance of Dwarf Essex rape as a green ration for hens.

What conditions are essential for the winter production of eggs?

Warm houses, a balanced ration containing plenty of green feed, meat scraps, grit and exercise.

Is artificial heating of the poultry house advisable?

No; artificial heating will do more harm than good. See that there are no cracks in the building; let the roof be low, just over the roosts; give the hens the right kind of feed at the right time; make them scratch for their living in the litter, and you will get eggs. The exercise is absolutely essential. Hens that gulp down all the food they can hold then stand around in groups do not lay.

How should eggs be sorted for the high-class market?

To command a fancy price, eggs must be strictly fresh, and uniform in size, color and shape. It costs no more to produce fancy eggs than it does to produce common ones, and the express charges on them are the same. Often, by a little sorting, five to ten cents per dozen above the market price may be obtained. The New York market prefers white eggs; the Boston market, brown eggs.

How may good laying hens be obtained?

The only method of developing a flock of good layers is by careful selection by the aid of trap nests. It has been learned that the good layers are not any particular breed, but a carefully selected and developed strain, of some breed.

What are some of the signs of good layers?

1. The best layers always moult last. If a hen has grown new feathers by October 1, she is probably unprofitable.
2. The shanks of the best layers are usually colorless.
3. A smooth and velvety comb is the sign of a good layer.

What have the recent egg-laying contests taught poultrymen?

Charles L. Opperman has summed up, for *The Country Gentleman*, the following facts:

That the 200-egg hen is a very substantial present-day reality.

That it is possible for the domestic fowl to produce more than 250 eggs in 365 consecutive days.

That high fecundity is primarily a question of strain or family rather than of breed.

That the selection and mating of highly prolific birds can result in a marked improvement of the average egg production.

That the continued selection of breeding stock upon lines that emphasize inherent tendency to ovarian activity is inclined to alter the weight and conformation of certain pure breeds.

That the average weight of the eggs from both high and low producing strains can be materially increased through selective breeding.

That the trap nest or the single-bird pen is the only absolute index to a bird's capacity for egg production.

That when other things are equal the so-called mongrel may be the equal, if not the superior, of many strains of pure-breeds.

That the absence of male birds from the laying pens does not affect the egg yield.

That the heavier breeds are the best winter layers.

That an abundant supply of plain, wholesome feed in conjunction with proper housing and management is conducive to increased production.

That the cost of feeding does not in itself make for profit or loss in the poultry business.

That the efficiency of different so-called standard rations cannot be exactly determined from their use in connection with small experimental pens of birds of unknown performance.

Mention the principal essentials of a proper poultry house.

1. Build on soil where there is a natural drainage. Dampness is fatal to chickens.

2. The house should be warm, well ventilated and free from drafts.

3. Let the house face the south and have windows on the south and east sides. Sunlight not only prevents the development of germs, but it has a vitalizing affect upon the fowls. Too much of it can not be had, especially in winter.

4. The roosts should all be on the same level. The natural instinct in birds is to seek high places for safety. If there are no high places, there will be no crowding or commotion at roosting time.

5. Ventilation may be obtained by muslin windows on the south side. They allow the air to enter, but prevent drafts.

6. Use dropping boards under the roosts. This will give more floor space, help to keep the hens warmer in cold weather and allow the droppings to be more easily removed.

7. A good plan is to build the nests under the front edge of the dropping boards, with openings behind and a hinged door in front that may be lowered when collecting the eggs. This will give the hens the privacy which they like when laying. There should be a platform back of the nests wide enough for the hens to walk on.

8. There should be provided a dust box, located where the sun can reach it. Keep it well filled with fine road dust.

9. Besides the dust box the essential "poultry furniture" consists of drinking fountains, self-feeding hoppers for dry mash, feed troughs and grit boxes. The drinking fountains will not be so easily contaminated, if they are raised on a small platform a foot or so above the floor.

The Missouri College of Agriculture, suggests the following for "hen-happiness and a full egg basket:"

Allow each hen four square feet of floor space.

Provide one square foot of glass to every fifteen square feet of floor space.

Locate the windows on the south side and place the tops not quite half as high as the house is wide.

Ventilate by placing one square foot of muslin to every fifteen square feet of floor space, or by making a slat front similar to the cupolas in barns. Be sure the house is free from cracks and that there are no openings for drafts on the back, ends and roof.

Build a floor eight inches higher than the surrounding ground. Fill in four inches of coarse stone, then two inches of clay and then two of dirt. This will make a dry floor.

Provide eight to ten inches of roosting space and one nest to every six hens.

Cover the floor with a foot or eighteen inches of straw. Feed the grain in the straw so as to encourage exercise.

What are the rules for taking care of the poultry house?

Keep it clean. This may be done by spraying, whitewashing and providing fresh clean litter. See that there is absolutely no accumulation of dampness. The nests should always be provided with clean dry straw and be free from lice. Lice and mites are formidable enemies of the poultry business. Unless you are prepared to keep them in check, you had better take up some other occupation.

What are the best methods for combating lice and mites?

The preparations given under "Useful Formulas" may be used successfully. One of the most convenient commercial preparations is "Chemo," manufactured and sold by The Chemo Co., Buffalo, N. Y. An excellent hand sprayer is furnished with the liquid.

POULTRY TROUBLES AND THEIR REMEDIES.

If all the required conditions regarding sanitation, pure food and feeding are complied with, there will be few poultry troubles. The poultryman should know that if his fowls begin to die off, something is wrong, and he should locate that trouble and correct it. Usually it is dampness, filth, poor ventilation, too crowded quarters, drafts, cold, over feeding, or impure food. Following are some of the more common troubles and suggested remedies:

BUMBLEFOOT.—The foot begins swelling at the toes and soon becomes large and clumsy. It is the result of an infection through some abrasion of the skin caused, perhaps, by jumping from a high roost to a hard floor.

Remedy.—Soak the foot in warm water and clean thoroughly. Remove any foreign substance; any soft place indicates puss, open with a sharp knife. Bathe the foot in a solution of carbolic acid and water, one teaspoonful to ten of water, and anoint with carbolized vaseline. Often the trouble may be remedied by putting on a warm linseed meal poultice, and after a half day lance where the skin seems the thinnest. Keep the fowl upon soft litter.

LIMBERNECK.—The bird is unable to control the head which droops to the ground. It is caused by eating putrid meat.

Remedy.—Remove the cause. Give 3 or 4 teaspoonfuls of castor oil for a grown fowl. If not cured within 3 or 4 days it is not advisable to keep it.

SCALY LEG.—This is caused by a parasite which lives under the scales of the legs, causing them to assume a rough, lifeless appearance.

Remedy.—Dip the legs in coal tar, kerosene oil, or rub them with carbolized vaseline.

GAPES.—The fowls keep opening their bills as though trying to swallow. It is caused by one or several forked red worms in the windpipe.

Remedy.—Make a double loop of horse hair, put it into the windpipe, turn it and pull the worms out. If this method can not be used, remove all the barbules from a long feather, except those at the tip, moisten with a mixture of oil of cloves and sweet oil, and insert gently into the windpipe of the fowl. Twist the feather around several times and draw it out. It will remove some of the worms and kill the others.

WHITE DIARRHEA.—The droppings become white and watery; the fowl stands around in a listless attitude with head down and eyes closed.

Remedy.—The writer has discovered no remedy for this disease. A good preventive is venetian red dissolved in the drinking water, 1 heaping teaspoonful to each pint of water.

ROUP.—Symptoms are a discharge from the nasal openings, dullness, prostration and fever. The discharge is at first thin and watery, but in two or three days become thick and obstructs the breathing.

Remedy.—Remove the bird from the flock and place in a warm, well ventilated room, free from drafts of air. Plunge the fowl's head, for a second or two, into a solution of 1 ounce of boric acid to 1 quart of water. Spraying the bird's head with kerosene oil is often very effective.

CROP BOUND.—The first symptom is a loss of appetite or an effort to swallow without being able to do so. The crop is seen to be large, firm and much distended. If no help is given, the conditions become aggravated, the breathing difficult, and death may result.

Remedy.—Force the bird to swallow a teaspoonful of sweet oil, then work the crop with the fingers, endeavoring to force some of the food out through the gullet. If this can not be done, the crop may be opened about an inch and the contents removed with a spoon or button hook. After this is done, wash out the crop with clean, warm water, sew up the openings, both in the crop and skin, using the best silk, and making four separate stitches in each cut.

Feed on milk and raw eggs beaten together for a day or two, and gradually change to soft mash.

FEATHER-EATING.—This is the result of a depraved appetite, and may be caused by too close confinement, or lack of animal matter in the food.

Remedy.—Give plenty of grit and animal food and a free run, if possible. See that mites do not trouble them at night.

VERTIGO.—The bird throws its head upward, backward or to one side. It may be caused by too much heat or direct sunlight.

Remedy.—Place the bird in a cool, shady place. Holding its head under a stream of cold water will often effect a cure.

POULTRY DON'TS.

Don't begin on too large a scale; work up.

Don't tolerate lice, dampness or filth.

Don't feed young chicks until they are two days old.

Don't allow sick hens in the same pen with healthy ones.

Don't frighten the hens.

Don't neglect to provide meat and grit.

Don't allow the hens to eat rotten food of any kind.

Don't neglect to supply pure water at all times.

Don't over feed.

Don't change rations abruptly.

Don't neglect to provide green food for winter.

Don't forget that it is the busy hens that produce the eggs.

Don't keep a lot of "boarders."

Don't feed mouldy grain of any kind.

Don't forget that sour milk is good for hens and chicks.

Don't neglect to put a little fresh lard, vaseline or sweet oil on the heads, under the wings and around the vents of hen-hatched chicks to kill and keep off the lice—don't use kerosene.

Don't expect to get as many eggs in the winter as in the spring or summer.

Don't forget that sulphur is a great germ killer. A spoonful or two in the mash once a week will help to ward off disease.

Don't feed poultry tonics or other patent nostrums.

Don't keep too many fowls in too small a space.

Don't let your hens trespass upon your neighbors.

Don't expect all the eggs to be fertile, if the cockerel runs with more than 15 hens.

Don't breed from immature pullets or from poor layers.

Don't forget that only careful selection and the weeding out of the poor ones can produce a flock of good layers.

Don't keep a hen longer than three years; two years is the limit with many.

PROFITABLE DAIRYING.

Into what two types may cattle be divided?

Into dairy cattle and beef cattle.

Mention the chief differences between dairy and beef cattle.

The following table gives the principal characteristics of each type:

	DAIRY.	BEEF.
Form	Wedge-shaped	Rectangular.
Head	Small, long, narrow.	Larger and thicker.
Eyes	Bright, prominent.	Same.
Muzzle	Mouth and nostrils large.	Same.
Neck	Fine, medium length, thin	Short, thick.
Shoulders	Thin, lean, bony.	Heavy, well-fleshed.
Back	Crooked.	Straight.
Flank	High.	Low.
Thighs	Thin.	Full, heavy.
Udder and milk veins...	Large prominent.	Small.
Skin and hair.....	Soft and pliable.	Same.

Mention the chief dairy breeds found in the United States, giving principal characteristics and place of origin.

Holstein-Friesian—large, white, with black patches; from Holland.

Ayrshire—medium in size, varying in color from red and brown to white, horns usually turning upward; from the county of Ayr in Scotland.

Brown Swiss—a shade from light to dark brown, a light tuft of hair between the horns, a narrow line along the back, black nose, with mouth surrounded by a meal-colored band; tongue and hoofs black, horns with black tips; from Switzerland.

Dutch Belted—about the same as Holstein-Friesian, except that a broad, white belt surrounds the body; from Holland.

Guernsey—a little larger than the Jerseys, hair yellow or reddish fawn color, skin yellow, nose flesh-colored; from the Island of Guernsey.

Jersey—small, gray or fawn colored, with black noses; from the Island of Jersey.

Mention the leading beef types found in the United States, with place of origin.

Shorthorn, or Durham, from England.

Hereford, from England.

Polled (hornless) Hereford, developed in the United States.

Aberdeen-Angus, from Scotland.

Polled Durham, developed in the United States.

Galloways, from Scotland.

Which is the most profitable beef breed for the American farmer?

Although opinions differ, the Herefords can be well recommended. They are very hardy, endure extremes of temperature well, and their young develop early. They are distinguished by their white faces.

What should be the attitude of the dairyman toward the beef breeds of cattle?

The dairyman who farms for profit should use care not to introduce any strain of the beef types into his herd.

How may a dairy be obtained?

1. By purchasing the entire herd from some farmer who is selling his farm or going into other business; 2. By raising it yourself; 3. By buying the cows in small lots from different farmers; 4. Purchasing from dealers who make a business of buying and selling.

What cautions should be observed in buying a dairy?

Nearly every farmer is trying to breed up and develop his herd. He will sell his best cows only at an exorbitant figure. He is, however, ready and anxious to dispose of his culls, the "boarders", very hard milkers, jumpers, kickers, and others that are undesirable. The beginner who procures a picked-up dairy will, usually, find himself in possession of a herd that is not only unprofitable, but difficult to keep within bounds. Only a person who has owned a dairy of this kind can understand the annoyances, losses and discomfitures that it will cause him.

What breed of cattle shall I buy?

This depends upon the individual tastes and the purpose for which the cows are kept. If for shipping milk to the city, Holsteins are the best; if for cream, Guernseys or Jerseys are preferable.

If for cream, which would be better, Guernseys or Jerseys?

Although opinions differ, the writer believes that, for cream, the Guernsey would prove more satisfactory. They are hardier, more tractable and give more milk, which averages almost as much butter fat as that of the Jerseys.

A breed of cattle can not be judged by two or three individual records. Now and then a Holstein will give richer milk than some Jerseys, and often a Jersey will give more milk than some Holsteins.

COW DON'TS.

Don't run your cows.

Don't neglect to dehorn the calves.

Don't keep cows that are unprofitable; use the scales and Babcock test.

Don't breed too young.

Don't expect much from a cross between a Holstein and a Jersey.

Don't try to raise all your feed, if your land is better adapted to something else.

Don't keep beef breeds, if you are in the business for milk.

Don't forget that cows need a variety of feed.

Don't expect much milk from timothy hay alone.

Don't teach your cattle to become unruly by tempting them to jump over poor fences.

Don't neglect your pasture.

COW TROUBLES AND THEIR REMEDIES.

Choked—When a cow becomes choked the obstruction usually lodges either at the entrance of the wind-pipe or down in the gullet (oesophagus), close to the stomach. The first is known as “high choke” and the second “low choke.”

In the first case the hand may be passed into the animal's throat and the object causing the choke grasped and drawn out. If the attendant is timid about passing his arm into the animal's mouth, the operation may be made safer by having an assistant hold a clevis in the mouth in order to keep the jaws apart. If it is a “low choke,” a piece of rubber hose from 6 to 10 feet in length may be passed carefully down the animal's throat, taking care that it does not pass toward the lungs, and on reaching the obstruction carefully pressed against it causing it to move into the stomach. If the hose is passed toward the lungs, it can easily be determined by passing the opposite end near the cheek and noting if air passes in and out as the animal breathes.

Bloating—If the cow is badly bloated, it is usually necessary to tap the animal at once. A special instrument, known as a trocar, is made for this purpose, but an ordinary pocket knife may be used. The small blade may be thrust through the animal's side into the paunch, and by turning the blade edge-wise to the cut the gas may be allowed to escape. The point for making the puncture should be on the left side, just back of the last rib, and from six to eight inches from the line of the back bone. If the case is not so urgent, relief may usually be obtained by placing a gag in the animal's mouth. For this purpose a round stick about two inches in diameter and a foot long will be needed. A rough one can be used by first wrapping in cloth. Press the stick back close to the corners of the mouth and hold in place by a string tied to each end and passing over the animal's head.

Standing the animal with fore-quarters elevated is beneficial in helping the gas to escape; also bathing the flanks with warm water will prove useful, by stimulating contraction of the stomach.

Hard Udders—Hard udders are due to an inflammation of the gland, usually due to bacterial infection. Simple inflammation of the udder, which comes on immediately after freshening, is usually due to the active changes taking place in the gland at this period and is less serious. Too rich a diet frequently hastens the trouble, especially among heifers. In this condition, place the cow on a light diet and give a drench of one pound of Epsom salts dissolved in water. A drench is given by turning the liquid down the animal's throat from a long-necked bottle.

If the hard udder develops at a later period and is due to bacteria, rub it thoroughly two or three times daily with a hot ointment of

equal parts of lard and turpentine. Milk frequently. Keep the bowels loose by an initial drench of one pound of Epsom salts dissolved in two quarts of water, then-half-pound doses repeated daily.

Milk Fever—Procure a common bicycle pump and a 3-inch silver or glass milking tube. Insert the tube in the teat and pump the udder full of air. This is an almost sure cure. Care should be taken that the pump and tube are perfectly clean and that only pure air is pumped in.

Gargeted Milk—Gargeted milk is milk which has become changed in the udder, the solids separating from the fluid portion. It is generally caused by the presence of bacteria in the milk glands. Treat same as for ropy milk (See under "Milk"), washing with antiseptics daily and milking last to prevent spreading to others. Fluid extract of Poke-root, one-half ounce in a pint of water, given three times daily as a drench, or given in the feed is very beneficial. Continue treatment for several days.

Cows Gnawing Bones or Eating Foreign Material—This condition is known as *pica* and is due to a depraved appetite on the part of the animal. Alkaline or salty tasting substances are especially attractive to cows in this condition. The disease may last for months. In some cases the animal becomes poor and even dies. The condition is generally supposed to be due to the lack of some of the necessary salts in the food or water. It may be due to imperfect digestion or assimilation on the part of the animal. The treatment consists in improving the digestion and the following prescription is recommended:

Iron sulphate.....	2 ounces
Powdered nux vomica.....	4 ounces
Powdered gentian root.....	8 ounces
Common salt	8 ounces
Arsenous acid	1 dram

Give a tablespoonful of this mixture twice a day with the feed. Continue the treatment until the animal is cured.

Abortion—This is a serious trouble and may be caused by injury or infection. It is easily communicated to other animals of the herd. Remove the cow from herd at once. Syringe the womb with 1 gallon of warm water containing 1 ounce of creolin and continue daily until no discharge is seen. Disinfect stables thoroughly. Do not let the cow go to bull for at least two months after aborting.

Hoof Disease—Usually caused by filthy stables, or standing in dirty water or mud. Shave off loose part and wash with warm water and moisten twice daily with a solution of 1 ounce chloride of zinc in 1 pint of soft water.

Sore Teats—Rub on, after milking, carbolated vaseline, which may be purchased at any drug store.

Tuberculosis—Often introduced into the herd through milk from the creamery. The symptoms are usually not noticeable in the early stages of the disease. Later symptoms are loss of flesh, loss of appetite, listlessness, a short, dry cough, diarrhoea, etc. Early stages of the disease may be detected by the tuberculin test, which consists of first taking the temperature for several days, then injecting tuberculin under the skin, and testing for a rise in temperature the following day. If there is no rise in the temperature, the cow does not have the disease. There is no cure, if present.

MILK.

Why is milk a good food for all young animals?

Milk contains, in the right proportions, all the nutrients needed to nourish and build up the body. It is the most perfect food known.

What is the composition of milk?

Every 100 pounds of milk contains about the following constituents:

Water	87	pounds
Fat	4	pounds
Milk sugar	5	pounds
Casein and albumen	3.3	pounds
Mineral matter	0.7	pounds
Total.....	100	pounds

What is meant by rich milk?

By rich milk is meant a milk that contains a high percentage of butter fat. The milk of the different breeds of cattle differ in this respect. The New York Agricultural Experiment Station, after a great many tests, gives the following averages:

Holstein-Friesian	3.4%
Ayrshire	3.6%
Shorthorn	4.4%
Devons	4.6%
Guernsey	5.5%
Jersey	5.6%

How does the richness of the milk from the same cow vary?

1. The milk is richer in fat just before the cow dries up.
2. The last of the milk drawn is richer than the first.

The feed has very little effect on the richness of the milk, its percent of butter fat depending almost entirely upon the cow.

What are some of the characteristics of milk?

While milk is usually the most valuable product of the farm, it is, also, of a very perishable nature. Bacteria of all kinds flourish in it and it quickly absorbs bad odors. It is only the clean milk that will retain its original character for any length of time.

How may the farmer produce clean milk?

By keeping the cow and her surroundings clean and wholesome. The stable should be sealed with matched lumber and no cobwebs or dust be allowed to accumulate. There should be plenty of window space and good ventilation. The cows and milkers must both be

healthy, the cows clean, the milk utensils of the best quality, clean and sterilized. The cows must have good feed and pure water. They should always be milked before feeding.

What causes milk to sour?

Sour milk is caused by bacteria which develop in it an acid (*lactic*) from the milk sugar. To prevent the development of bacteria, the milk should be cooled at once and kept cool.

What is the source of bacteria in milk?

Bacteria get into milk after it is drawn, milk from healthy cows being free from them. All particles of dust and dirt carry with them multitudes of bacteria which remain after the dirt particles have been strained out. If black specks of dirt appear on the foam above the milk, the conditions of cleanliness are not what they should be.

What is sterilized milk?

Sterilized milk is milk that is heated to the boiling point, or above it under pressure. Milk is seldom sterilized as the process coagulates the albumen and changes the flavor of the milk slightly. Pasteurized milk is often spoken of as sterilized milk.

What is pasteurized milk?

Pasteurized milk is milk that has been heated to a temperature high enough to kill disease-causing germs and then cooled to 50° F., or lower. Usually the milk is heated to 145° and kept there for thirty minutes. If heated above 145°, one minute may be subtracted from the thirty minutes for every degree above 145° to which the milk is heated.

What is certified milk?

Certified milk is milk produced under legal contract between a dairyman and a medical milk association. Certified milk undergoes no process of purification, but is produced under the most sanitary conditions possible. The stables are kept scrupulously clean, the milkers wear clean, white milking suits, the cows are thoroughly brushed and their udders and flanks wiped with a damp cloth, the milker's hands must be absolutely clean and washed after each milking, in short, every possible precaution is taken to prevent germs entering the milk.

Is pasteurized milk more desirable for general consumption than unpasteurized milk?

In general, it may be said that if milk is not suitable for food without being pasteurized, it is not suitable at all. While pasteurization undoubtedly destroys many disease-causing germs, it often covers up worse conditions. The harmful products of filth accumulated by careless milking still remain. Besides, the bacteria which cause the natural souring of milk and tell us when it is unfit for infants and invalids are destroyed. Many of the stomach disorders from which infants suffer may be traced to pasteurized milk.

What special care should be exercised in choosing milk utensils?

All milk utensils should be heavily tinned and as free from seams as is possible to make them. All crevices and seams should be flushed full with solder. If pails of this kind can not be purchased, take them to your local tinner and have him fix them for you.

What causes bad flavors in milk?

Bad flavors in milk may be caused by dirt, foul odors in the stable, bacteria, or conditions found in the cow. If the cow has digestive disorders of any sort her milk will be affected. If the cow is milked within a few weeks of calving time, the milk will become bitter. Milk that has a "barny" smell is unfit for human use. Certain feeds, such as leeks, turnips, cabbage, rape and rye taint the milk more or less, especially if fed just before milking time.

What is the cause and cure of ropy milk?

Ropy milk is caused by fungi which develop in the milk after it is drawn. They are microscopic plants which grow into long filaments so that the milk becomes stringy, or ropy. The source is probably due to stagnant pools of water, and a cow becoming infected may spread it to others. To get rid of it, remove the cause. See that the cows have access to plenty of pure water. Determine which cows are affected and milk them after the others. Cleanse the udders of all suspected cows, once a day, with a one percent solution of carbolic acid or creolin. The hands of the milkers should be washed in an antiseptic solution after milking the affected animals. All milking utensils should be thoroughly washed and scalded after using. With these precautions the conditions usually do not last longer than ten days or two weeks.

Do thunder showers hasten the souring of milk?

Thunder showers cause milk to sour quickly, although the process is not well understood. Bacteriologists have attempted to explain it as a result of the warmer or more humid atmosphere existing just before a shower; but this is unsatisfactory, since milk in refrigerators seems to be affected much the same way.

Are milking machines a success?

Milking machines have passed the stage of experiment and are now considered necessities by many dairymen. With one of them one man can easily do the work of four good milkers, and the milk will be much cleaner. Care must be taken that the machine is properly installed and that the engine runs at uniform speed. Cleanliness here, as with all other milk-handling devices, is absolutely essential to success.

Will it pay a farmer to own a cream separator?

If a farmer owns at least ten cows, a separator will be profitable. If however, a separator is used, a milk house will be almost a necessity. The machine must have a solid, unyielding, absolutely level founda-

tion. If a large amount of milk is to be separated, a small engine will be needed to turn the machine and this will necessitate a speed regulator. Water will be needed to cool the cream. All these matters should be taken into consideration before buying a machine.

What are the most reliable makes of cream separators?

Each manufacturer will swear that his machine is the best and then proceed to prove it. The writer does not advise purchasing the cheap machines sent out by the mail order houses. The Sharpless, De Laval and United States are all good. Send to each firm for their literature before you buy. If possible have one or more set up for a trial test. You will find that some are more easily cleaned than others, which may be an important consideration.

How much milk will a cow produce in a year?

A good dairy cow should produce 5,000 pounds of milk per year. If she produces less than 3,000 pounds, she is a "boarder" and unprofitable. Get rid of her. A quart of milk weighs 2.15 pounds.

What are the general directions for home butter making?

1. Cool the cream from the separator as soon as possible to 55° F. or lower.

2. Never mix warm cream with cool cream.

3. Mix all cream to be churned in one vat or can, at least eighteen hours before churning.

4. Ripen at a temperature of 70° to 75° F. for from six to eight hours, stirring it frequently during this period.

5. Cool cream to churning temperature as soon as ripe.

6. Let the cream stand eight hours or more (over night) at the churning temperature.

7. The temperature of churning should be such as to make the butter come in from thirty-five to forty minutes, usually 55° to 60° F.

8. If it is desired to use artificial coloring, it should be added to the cream just before churning.

9. Stop churning when the granules are about the size of peas, varying to wheat, and draw off the buttermilk.

10. Wash the butter with cold water twice, by pouring it on and draining it off. Use as much cold water each time as half the amount of the buttermilk.

11. Add the salt while the butter is in granular form, using about one to one and one-half ounces for each pound of butter, according to the demands of the market.

12. Work the butter just enough to distribute the salt evenly.

13. If the butter is to go on the market, it should be put in neat, attractive packages.

MILK DON'TS.

Don't put milk in a vessel that has not previously been scalded.

Don't try to sell impure milk.

Don't tolerate wet milkers.

Don't neglect to milk the cows clean.

Don't milk with dirty hands.

Don't set the milk down in the stable.

CALVES.

Is it profitable for the farmer to raise his own dairy?

The advantages are all with the farmer. It is only the man with considerable capital who can go out and buy the class of cows that a dairyman can afford to keep. Besides, the high-priced cows are often disappointments, many not being as represented and some even proving to be unprofitable. With pure bred sires, the descendants of well-known milking families for several generations, the farmer can start with a scrub herd and in a few years build up a splendid dairy. The cost will be much less. In fact, the cows will pay their way and reward the farmer for his efforts.

What rules should govern the farmer in selecting the calves to be raised?

Raise calves from only the good cows. The Babcock test and the scales, applied to each individual cow, are the only means by which her real merit can be known. The intelligent farmer will not waste his time and money raising calves from cows of unknown merit. If both the sire and mother are right, there need be little doubt as to the value of the offspring.

What care should be taken of the young calf?

Always let it suck the first milk of the mother. This contains a special physicing property that the young calf needs. After three days it may be taught to drink. The calf should always be kept in a warm, dry place with plenty of fresh air and sunlight. It will not grow if compelled to sleep on a cold, damp bed.

How may a calf be taught to drink?

With the palm upward insert two fingers into the calf's mouth so that it can suck in the air between them. Lower your hand into the pail and when the calf is sucking in the milk gently withdraw the fingers. This process repeated two or three times will usually be sufficient. Often the calf's head will have to be pushed downward, as it naturally looks upward for its nourishment.

Give directions for feeding the young calf.

Give the calf new milk three times a day for the first fourteen days. From the time the calf is ten days old the feed may be slightly increased; but it should never be fed so much that it will not want more. More trouble and loss result from overfeeding than from any other cause.

How may a calf be raised without milk?

The young calf should have fresh milk for at least two weeks. After this time a porridge composed of one part oil meal, one part white middlings and one part wheat bran may be gradually substituted. Begin by boiling two spoonfuls in a pint of water and feed with

milk. The amount of the porridge may be gradually increased and the milk diminished until only the porridge is used. Let the mixture come to a boil while it is being stirred, then let cool to milk warm. Feed three times a day, always just enough so that the calf will want a little more.

What changes may be made in the feed of the calf as it grows older?

If the milk is being used for butter or sent to a creamery, the calf, when two weeks old, may be gradually started on the fresh separated milk. The change may be started when the calf is seven or eight days old and changed so gradually that it will be on a complete ration of separated milk when it is fourteen days old. At the time the change is being made stock molasses should be fed at the rate of one tablespoonful to a gallon of milk. If too much is fed, it will have a bad effect upon the bowels of the calf. The calf should get a meal ration as soon as it will begin to eat it, by feeding it dry in the bucket. The best meal ration for young calves is white shorts and oil meal, equal parts.

How should the calf be fed during the summer?

Besides the ration as above given, the calf should get some grass or alfalfa hay. A good pasture is almost indispensable. The pasture should have plenty of shade and a covered shelter with dry bedding where the calf can sleep nights and get shelter from storms. All these details must be looked after, if you would be a successful dairyman.

What causes diarrhea ("scours") in calves?

Often it is caused by using sour, filthy feeding utensils. It may also be caused by over feeding, a too abrupt change in feed, or wet, filthy surroundings. Remove the cause.

How may diarrhea in calves be cured?

The following remedy is recommended by the Department of Agriculture in their treatise on the diseases of cattle in their revised edition, 1904:

"Treatment will vary according to the nature and stage of the disease. When the disease is not wide-spread, but isolated cases only occur, it may be assumed to be a simple diarrhea and is easily dealt with. The first object is to remove irritant matter from stomach and bowels, and for this one or two ounces of castor oil may be given, according to the size of the calf. Reduce the milk by one-half or two-thirds. If the stools smell particularly sour, it may be replaced by one ounce calcined magnesia, and in any case a tablespoonful or two of lime-water must be given with each meal. Great harm is often done by giving opium and astringents at the outset. These merely serve to bind up the bowels and retain the irritant source of the trouble; literally 'to shut up the wolf in the sheepfold.' When the offending agents have been expelled in this way, carminatives and demulcent agents may be given—1 dram anise water, 1 dram nitrate of bismuth, and 1 dram

gum arabic, three times a day. Under such a course, the consistency of the stools should increase until in a day or two they become natural."

A teaspoonful of dried blood, fed with the milk for a day or two, is a much simpler remedy and often proves effective.

Is sour milk or whey harmful for calves?

Calves may be fed either sour milk or whey, that has not stood too long. Care should be taken that any animal's food ration be changed gradually.

May calves be fed hay? If so, when?

Most calves will begin to eat a little hay when they are six weeks old, after which a little fine clover hay or alfalfa may be fed to them to good advantage. It will often pay to buy alfalfa hay for this purpose.

How may calves be weaned without whole milk?

After about four days on the whole milk, sweet skimmed milk may be given. To this should be added gradually fine corn meal, or oil meal jelly. To make the jelly, boil oil meal in water until it forms a thick paste. If kept cool, it will keep until used up. Begin by using a half-teacupful in the milk and increase slowly until a pint is used in the milk twice a day.

Does the calf need water?

The calf will drink water at an early age, if it has an opportunity, since its skim milk ration does not give it all the moisture that it needs. This need of the calf for water is not generally understood. At feeding time the animal is not only hungry but very thirsty; and, as a result, gorges itself with milk or drinks too rapidly when it has a chance, often causing digestive troubles. Supply it with water at all times. A pasture containing running water is ideal for the calf. Its milk is its food; water is its drink.

How may the horns be prevented from growing?

Press the hair back and rub the button thoroughly, as soon as it can be felt, with the moistened end of a stick of caustic potash, covering a spot about as large as a silver quarter. One thorough treatment will usually be sufficient.

CALF DON'TS.

Don't overfeed.

Don't feed a young calf cold milk.

Don't compel the calf to sleep on a wet bed.

Don't change feed abruptly.

Don't let the children worry the calves.

Don't put the calves in a pasture so small that it will not furnish enough grass. As the calves learn to eat grass, the less other feed they will need.

Don't use fences that the calves can jump over, unless you want unruly cows.

Don't put the calves to pasture too early in the spring or keep them out too late in the fall.

Don't let the flies keep the calves from growing.

FEEDING DAIRY COWS.

What is the function of food?

Food furnishes material for the development and growth of all the tissues; supplies heat, force and energy; furnishes material to repair waste and maintain life, and for special products, such as milk, eggs, wool, etc.

How may foods be classified?

Foods may be classified as protein, carbohydrates, fats and mineral matter.

What are protein foods?

Protein foods are foods containing nitrogen. Protein is necessary to animal life, building up the muscles and tissues of the body and at times furnishing heat and energy as well as forming fat.

What are carbohydrates?

Carbohydrates are compounds of carbon, hydrogen and oxygen, the last two in the proportion found in water. The principal carbohydrates are the sugars, cellulose, starches and gums. They are essential to furnish energy and produce fat. The main source of carbohydrates is corn, though it is supplied in oats, barley, bran, middlings and grass forage, as rape, rye and oats, and to some extent in the protein foods.

What mineral matter is used for food?

Some of the minerals used as food are calcium, phosphorus, sodium, potassium, iron, etc. They are found, in combination with other substances, in nearly all food stuffs and some dissolved in water.

What different food substances does stock need?

Every living creature needs some of each class of foods. The minerals are so plentiful that no account need be taken of them. To supply a correct nutritive ratio for protein and carbohydrates plus the fats, is a problem for the modern farmer and stockman to solve.

What is meant by a "nutritive ratio?"

By a "nutritive ratio" is meant the relation between the digestible protein and the digestible carbohydrates and fat in any food stuff. For example, 100 pounds of timothy hay contains 2.8 pounds of digestible protein and an equivalent of 46.6 pounds of carbohydrates including the fat equivalent. Dividing both the protein and the carbohydrate equivalent by 2.8, we get the quotients, 1 and 16.6; therefore the "nutritive ratio" of timothy hay is 1; 16.6, too broad for the best purposes, as will presently be learned.

What is a feeding standard?

A feeding standard is a statement of the amount of dry matter, protein, carbohydrates and fats needed daily for an animal weighing

1000 pounds. For example, it has been decided that a proper standard for a 1000-pound cow giving 22 pounds of milk per day is an amount of feed equal to 29 pounds of dry matter, containing 2.5 pounds of protein, equal to 14.1 pounds of carbohydrates and fats combined.

What is a balanced ration?

A balanced ration is one in which the bulk and the digestible protein and carbohydrates are in that proportion which will most economically produce the particular results desired in feeding. The proper ratio for dairy cattle is about 1:6.

What is meant by "narrow" and "wide" rations?

According to general usage, a ratio of protein to carbohydrates below 1 : 5.5 is "narrow," while one above 1 : 8 is "wide."

What are the advantages of balanced rations?

Balanced rations are apt to offer the best results, because the animal thus secures nutriment in much the same proportion that she utilizes them. There is no material excess to induce disarrangement of the digestive system, or to be wasted; and there is less likelihood of unsupplied deficiencies.

Are balanced rations absolutely necessary?

Perfectly balanced rations are not practical or possible. All any dairyman can do is to use the approximation which produces the best results.

How can a dairyman balance his own rations?

The dairyman can use Table IX as a guide in selecting a balanced ration for his stock. For example,—

Looking down the list, he sees at once that it would be folly to attempt to winter his cattle on oat straw, because the ratio, 1 : 32, is far too broad. Since the table gives him the protein and carbohydrate equivalent in 100 pounds of any feed, he can find the amount in smaller portions and balance his rations as follows:

	Protein	Carbohydrate equivalent
20 lbs. of timothy contains.	.56	9.32
4 lbs. cottonseed meal contains.	1.488	1.776
	2.048)2.048	11.096
Gives a ratio of	1 to	5.4

He sees that this ratio is a little too narrow, so tries 3 pounds of the meal, which comes nearer the required ratio, and is, also, somewhat cheaper.

The New York State College of Agriculture gives the following plan for balancing rations in New York State. It is entitled:

“A READY METHOD FOR BALANCING A RATION FOR DAIRY COWS.”

TABLE.

LOW PROTEIN GROUP.	MEDIUM PROTEIN GROUP.	HIGH PROTEIN GROUP.
Less than 12% total protein.	12% to 25% total protein.	More than 25% total protein.
Corn 10.3	Wheat bran 15.4	Malt sprouts 26.3
Oats 11.4	Mixed wheat feed ..16.3	Linseed Oil Meal ...53.9
Wheat 11.9	Standard wheat mid- dlings 16.9	Cotton Seed Meal ..45.3
Rye 11.3	Flour Wheat Mid- dlings 19.2	Gluten Feed 25.0
Barley 12.0	Cotton Seed feed...20.0	Brewers' dried grains 25.0
Buckwheat 10.8	Buckwheat feed (shuck in).....18.3	Distillers' dried grains (corn)....31.2
Hominy Chop.....10.5	Pea Meal 20.2	Buckwheat midds (free from shuck) 26.7
Dried beet pulp 8.1	Cull Beans 21.6	
Corn and cob meal .. 8.5		

“Heavy” Foods Are In **DARK FACED Type**, “Light” Foods In Ordinary Type.

HOW TO USE THE TABLE.

The ordinary coarse foods in the State of New York are mixed hay, corn silage and corn stalks or fodder. These are always similar in composition as far as the balance between protein and carbohydrates is concerned.

The ration then is usually balanced on the grain food.

Ordinary grain foods may be conveniently divided into three groups: Low protein (less than 12%), Medium protein (12% to 25%) and High protein (over 25%).

For the sake of variety it is advisable to use three grain foods.

If one low protein food, one medium protein food and one high protein food are mixed together, equal parts by weight, the mixture will make a well balanced ration to be used with the ordinary mixed hay, silage or corn fodder.

If clover or alfalfa hay is largely used, less high protein food is necessary.

In amount, in addition to what hay and silage she will readily eat, a cow, in full milk, giving 4% milk, or better, should have 1 pound of grain to 3 or 3½ pounds of milk daily; a cow giving milk with less than 4% of fat should have 1 pound of grain to 3½ or 4 pounds of milk. An ideal grain ration should weigh about 1 pound to the quart. To secure this, the mixture should contain at least one “light” food.

What are concentrates?

Concentrates are grains and meals.

Will stock do well on concentrates alone?

All stock requires coarse feed. A German investigator, Emil V. Wolff, decided, about the middle of the last century, that dairy cows should have 24.5 pounds of dry matter daily and that this should contain 2.5 pounds of digestible protein, 12.5 pounds of digestible carbohydrates and .4 pounds of digestible fat,—nutritive ratio, 1:5.4. This is known as the "Wolff Standard." More recent investigators have changed it somewhat and widened the ratio, especially for milk production. The farmer need not concern himself greatly about the exact ratio, provided he supplies food that contains the required nutrients. To be exact, a table would have to be made for each animal; for, while one cow seems to thrive best on a certain amount of protein, others will require more or less for the same result. The successful dairyman studies the characteristics and needs of each animal.

What are some of the important principles that should govern the feeding of dairy cows?

1. The average cow requires about 24 pounds of digestible dry matter daily.
2. Roughly, two-thirds of this digestible matter should be furnished in the form of roughage and one third in concentrates.
3. Not less than two-thirds of the total dry matter should be digestible.
4. Variety in feeds is required, if cows are to yield the best results.
5. The succulence which in summer is found in pasture grass and which is so desirable a feature in a dairy ration, may be furnished during other seasons by silage or roots.
6. Feed all the roughage a cow will clean up.
7. Feed 1 pound of grain to every three or four pounds of milk yielded daily, varying according to the roughage supplied and the per cent of butter fat in the milk. The richer the milk, the more meal is required.
8. A good arrangement for feeding is to feed one-half of the grain and silage in the morning and one-half at night after milking, and to feed hay after the other feeds are consumed. A little hay may be fed at noon, if desired.
9. Vary the amount of feed according to the size and production of the individual cow.
10. Salt regularly; three-fourths of an ounce daily is sufficient.
11. Water regularly, taking the chill off the water in the winter.
12. Change from barn feed to pasture feed gradually in the spring.
13. Feed grain in summer to high producing cows, varying the amount fed according to pasture supplies.
14. Use soiling crops or silage to supplement short pastures.
15. Keep dry cows in good flesh.
16. Give laxative foods to a cow for a week previous to her freshening.

17. Work up gradually to the full grain ration after freshening, taking two or three weeks to do this.
18. Reduce the grain ration slowly as production decreases.
19. Watch your cows and feed according to individual needs.
20. Let all feed be fresh and clean.
21. At the present price (1915) cottonseed meal is one of the cheapest protein feeds.

What are the principal winter food stuffs for cattle?

Timothy, red clover, alfalfa, corn fodder and stover, orchard grass, red top, alsike clover, mixed grasses and clover, oat straw, bean straw and millet. Study the feeding table to determine the relative values of these different rations.

What are the characteristics of the more common feeds?

Bulletin No. 114, Pennsylvania Station, gives the following characteristics under the heading, "Selecting Feeds":

ALFALFA MEAL, more convenient to handle than hay, much easier to adulterate, price usually excessive, rich in protein.

BEET PULP, soaked up, a good substitute for silage or roots but higher in price.

BRAN, (wheat) light, bulky, appetizing, high in mineral matter, high in crude fiber. Relatively expensive at present prices.

BREWERS' GRAINS, rich in protein, very variable in composition, bulky, must be fed with other feeds.

BUCKWHEAT, low in protein—usually pays to sell it and buy back the middlings.

BUCKWHEAT MIDDINGS, heavy, usually economical source of protein, tend to make soft, oily butter.

BULKY FEED, bran, gluten feed, ajax flakes, distillers' grains, corn and cob meal.

CONSTIPATING, cottonseed meal, corn fodder and hay.

CORN, easily digested, usually cheapest source of energy. Pays to grind.

CORN AND COB MEAL, bulky, considerable crude fiber, nearly equal to corn meal in ration because of bulky nature. Ground fine.

COTTONSEED MEAL, high in protein, heavy, should be fed with something else, makes for hard butter, relatively cheap source of protein, ordinarily should not constitute more than one-third of the mixture.

DISTILLERS' DRIED GRAINS, mostly corn, light, bulky, high in protein, not readily eaten alone.

DISTILLERS' DRIED GRAINS, mostly rye, similar in character to the corn grains, lower in digestible protein.

GLUTEN FEED, rich in protein, should be fed with other grains, usually a desirable and economical source of protein.

HOMINY CHOP, usually economical source of energy, low in protein, palatable, heavy. Good substitute for corn meal if needed.

LAXATIVE, oil meal, bran slightly, silage, roots.

MOLASSES FEEDS, usually high in waste materials and too high in price for their feed value.

NOT PALATABLE, gluten feed, brewers' and distillers' grains, cottonseed meal.

OATS, good feed, rich in mineral matter, high in crude fiber, not high enough in protein to use for balancing a ration, too expensive to feed at the past year's prices, good for calves, especially so if ground and hulls sifted out.

PROPRIETARY FEEDS, usually variable in composition, frequently contain weed seed and useless waste material, high in fiber and relatively expensive for the amount of energy furnished, save labor of mixing.

ROOTS, desirable substitute for silage, usually cost more to grow.

SILAGE, succulent, appetizing, economical, low in protein, should be fed after milking, a little hay or dry fodder should always be fed with it. One of the best farm grown feeds for milk products.

How has the up-to-date farmer solved the problem of economical feeding?

By the use of the modern silo. A few acres of Indian corn properly cared for and placed in the silo at the proper time and in the proper way will furnish as much feed as several times the acreage of timothy. It will, also, be more palatable to the cattle and better relished. The time has come when the American farmer can not afford to raise timothy, except for horse feed. He must produce his fodder on a smaller acreage, using the extra to raise his grain and for crops to sell. The practice of cutting 50 to 70 acres of timothy, as is the custom on most of the dairy farms of Western New York and then buying grain is suicidal as far as profit is concerned.

SILOS AND SILAGE.

What principles should be observed in the construction of a silo?

Build a good one, or none at all. The cylindrical form is the best. It should be air tight and height in proportion to its diameter, in order to get the proper pressure. The Modern Silage Methods gives the following table of capacities of different silos; also the required acreage for different numbers of cattle fed 40 pounds daily for six months.

Diameter Feet	Depth Feet	Capacity Tons	Aeres of corn Aeres	No. of cows Cows
10	20	26	2.0	8
12	20	38	3.0	11
12	24	49	3.4	13
12	28	60	4.0	15
14	22	61	4.5	17
14	24	67	4.7	19
14	28	83	5.5	22
14	30	93	6.0	23
16	26	97	7.0	26
16	30	119	8.0	29
18	50	151	10.0	37
18	36	189	12.3	45

What is silage?

Silage, also called ensilage, is the green food preserved in a silo.

What crops may be used for silage?

Cowpeas, soy-beans, clover, sorghum, peas, oats, millet, etc., have been used for silage, but Indian corn is preeminently the best crop for the New England and Western states.

When should corn raised for silage be cut?

Cut the corn when the ears are beginning to glaze. If too green, the silage is apt to sour and affect the milk; if too mature, it is apt to mould and become unfit for fodder.

How should corn be put into the silo?

It should be cut with a cutter into pieces about an inch long and carried into the silo with a blower. It should be well tread down as it comes in, especially around the edges.

Why does not the feed put into the silo spoil?

At first the mass heats and carbonic acid gas is formed. The heat partially cooks the food and all bacteria are destroyed. The oxygen being exhausted, the food is preserved the same as canned corn or fruits which the housewife puts up for winter use.

How should silage be fed?

Feed about two bushels per day, one in the morning and the other at night. Any other fodder that the farmer may have can be fed at noon, although the most satisfactory results are obtained by feeding alfalfa or some meal rich in protein to balance the somewhat wide ratio in the silage.

Is silage good for horses?

Good silage is all right for horses; but poor silage, especially that which shows blue mould, is injurious and should never be used. As a rule, it is safer to feed the horses alfalfa or timothy and grain.

What is meant by "soiling?"

By "soiling" is meant bringing fodder fresh from the fields and feeding it to cattle confined in inclosures. Soiling is growing more popular each year and wonderful results from it have been reported. The objection to it is the labor involved.

What are the best soiling crops?

Winter rye (for early soiling), Indian corn, clover, alfalfa, oats and peas mixed.

Which will produce better results, silage or soiling?

In all recorded tests soiling has produced the greater milk flow.

Summarize the Advantages of the Silo to the Farmer.

Prof. J. H. Skinner, of Purdue University, has formulated the following ten reasons why every farmer should have a silo:

1. The silo preserves the palatability and succulence of the green corn plant for winter feeding.
2. It helps to make use of the entire corn plant.
3. The silo increases the live stock capacity of the farm.
4. Silage is a good summer feed when pastures are short.
5. Because of the small amount of ground space required by the silo, it is an economical means of storing forage.
6. The silo prevents waste of corn stalks, leaves and husks, which contain about two-fifths of the feeding value of the corn plant.
7. The silo located near the feed manger is an assurance of having feed near at hand in stormy as well as fair weather.
8. The silo assists in reducing the cost of grains in fattening cattle and sheep.
9. Silage greatly increases the milk flow during the winter season and decreases the cost of production.
10. There are no stalks to bother in the manure when corn is put into silo.

GRAIN MIXTURES FOR MILK PRODUCTION.

The following grain mixtures for milk production have been selected from those used by successful dairymen and those approved by experiment stations or suggested by reliable farm papers. No. 5 is the one used by Dr. H. W. Wiley at his famous farm, at Bluemont, Va.

It is impossible to suggest mixtures that will fit all conditions, as much will necessarily depend upon what the farmer raises, what his roughage is, or what he can buy the cheapest. The mixtures given below are to supplement corn silage and roughage, unless otherwise stated.

Feed 1 pound of the grain mixture to every $3\frac{1}{2}$ or 4 pounds of milk, according to the percentage of butter fat.

No. 1.

Cottonseed meal	200 lbs.
Buckwheat middlings	100 lbs.
Corn and cob meal.....	500 lbs.
Linseed meal	50 lbs.

No. 2.

Corn and cob meal.....	300 lbs.
Buckwheat middlings	200 lbs.
Wheat bran	100 lbs.
Beet pulp	200 lbs.
Oil meal	50 lbs.

No. 3.

Cottonseed meal	300 lbs.
Brewers' grain	200 lbs.
Corn and cob meal.....	200 lbs.
Beet pulp	100 lbs.

No. 4.

Cottonseed meal	300 lbs.
Distillers' dried grains.....	200 lbs.
Wheat middlings	300 lbs.
Corn meal	100 lbs.

This mixture is to balance one of hay and straw: no silage.

No. 5.

Cottonseed meal	100 lbs.
Wheat bran	100 lbs.
Corn and cob meal	100 lbs.

For cows that produce 22 pounds of milk per day, Dr. Wiley's ration is 8 lbs. of the grain mixture, 35 lbs. of silage and 8 lbs. of clover hay. Commenting on this ration, Mr. Bishop, Dr. Wiley's partner and manager says:

"This ration will not be found to supply as much dry matter as the Wolff-Lehman standard calls for, but where silage is fed that is not necessary."

No. 6.

Wheat bran	100 lbs.
Linseed oil meal	100 lbs.
Corn meal	200 lbs.
Ground oats	200 lbs.

No. 7.

Wheat bran	600 lbs.
Cotton seed meal	200 lbs.

Feed with 35 pounds of silage and 10 pounds of leguminous hay—clover or alfalfa.

No. 8.

Corn meal	500 lbs.
Cotton seed meal	200 lbs.
Distillers' grains	300 lbs.

Feed with mixed hay, or corn stover and clover with silage.

No. 9.

Bran	125 lbs.
Cotton seed meal	125 lbs.
Corn meal	100 lbs.

Feed with timothy hay or corn stover, with silage as part of the roughage, feeding about 10 pounds of timothy or stover.

No. 10.**A Fattening Ration.**

Corn meal	100 lbs.
Cotton seed meal	40 lbs.
Cotton seed hulls	100 lbs.

No. 11.

Distillers' grains	200 lbs.
Oil meal	100 lbs.
Corn meal	100 lbs.
Buckwheat middlings	100 lbs.

No. 12.

Cotton seed meal	200 lbs.
Chops (corn and oats ground together)....	400 lbs.

Feed with timothy, stover and clover hay.

PROFITABLE HOG RAISING.

What is the best breed of hogs to raise for the general market?

The Berkshires, Poland Chinas, Duroc Jerseys and Chester White breeds have all proved themselves good market hogs. For some special markets of course the strictly bacon breeds, the Tamworths and Yorkshires as well as the Hampshires have proved themselves of great merit. It would hardly be possible to say which is the best breed to raise for the general market. Any of the four breeds mentioned above should be satisfactory.

How may the Eastern farmer raise and properly care for one hundred hogs?

Note.—The following answer to this question was furnished by H. W. Mumford, Professor of Animal Industry in the College of Agriculture, University of Illinois.

THE EQUIPMENT.

In order to care properly for one hundred hogs, some special equipment will be necessary. The housing will depend upon the severity of weather and the time at which the pigs are to be farrowed. For early farrowing, it is necessary to have a warm hog house, well equipped with windows to furnish sunshine which is essential for the welfare of young animals.

PASTURE LOTS AND EXERCISE.

The providing of and construction of pasture lots must receive careful consideration from the standpoint of convenience to the stockman and for the good of the hogs. It is essential that hogs, both breeding and market hogs, receive plenty of exercise at all seasons of the year. In winter, hogs will not take proper exercise unless compelled to do so. One of the best schemes to provide exercise is to place the sleeping quarters and feed troughs at opposite ends of the lot, requiring the hog to travel at least that distance and back for each feed. Forty rods is not too great a distance for this purpose.

FEEDING.

After the equipment necessary for hog breeding is considered, the successful breeder should know the food requirements for the proper growth and development of the pig. The principal constituent parts which go to make up the hog feed include water, protein, carbohydrate or fat, and ash or mineral matter. All foods require a certain amount of these constituents, but in varying amounts. Consequently a general knowledge of feeds and their relative composition and food value is essential. Various body functions require large amounts of water, as in digestion and carrying off waste matter. In summer the hog will probably drink sufficient water, but in winter it may be necessary to force the hog to drink more water by mixing it with feed to form a slop.

Protein is necessary to build up tissue and so is especially necessary during the period of growth. It may be supplied by legume pastures; legume hay (alfalfa, clover, soy beans, etc.); packinghouse products, as tankage; middlings and bran, which contain a larger percentage than common grains, or by milk.

Carbohydrate or fat is essential to furnish energy and produce fat. The main source of carbohydrate is corn, though carbohydrate is supplied in oats, barley, bran, middlings, grass forage, as rape, rye and oats, and to some extent in such feeds mentioned above as supplying protein.

Mineral matter is required to build the body framework or skeleton. Mineral matter is found in all feeds, but in small amounts, so it is necessary for best development to supply it in the form of bone meal, which supplies phosphorus; limestone, which supplies calcium, and salt and potash, which also supply material for bone construction and other vital body functions.

THE GROWING PIGS.

As the hog matures, a larger percentage of carbohydrate or fat is required and less of the other food nutrients. However, the brood sow requires all of the foods needed to grow the pig for the proper development of her offspring. The pigs for two months will get most of their sustenance from their dams, following which time the cheapest feed can be supplied by forage crops. Alfalfa is the best of these, followed by clover, bluegrass, or annuals like rape, soy beans, cow peas and oats. The pasture should be supplemented by slop which may contain ground grain, bran or middlings, and milk. The slop should be made up with feeds to supply what the forage lacks. A legume forage does not require a high protein supplement feed; a grass pasture requires protein in the supplemental feeds, as middlings, milk and tankage. A good growing ration for pigs without forage is corn 60 per cent, middlings 20 per cent and tankage 10 per cent. With a legume pasture, tankage is unnecessary.

FORAGE CROPS.

With proper use of forage crops throughout the growing season, the pigs can be grown to a weight of 100 to 150 pounds very cheaply. During the fattening period, the feeds should be of a fattening nature. Corn is pre-eminently a fattening feed, and in the corn belt is used for that purpose almost entirely in pork production. After making the best use possible of forage crops, one thousand bushels of corn should be sufficient for finishing one hundred hogs to the weight of 250 pounds. Other feeds, such as ground oats or barley, may be substituted, at least in part, for the corn.

Is hogging off corn profitable?

If a farmer has no great need for his stover, it will pay him to fence in a few acres and give the harvesting and husking of it over to the hogs. In this way not only will the hogs be easily and quickly fattened for market, but the labor and expense of cutting and husking the corn will be saved—an important item, especially when the

farmer is short of help. The hogs will not miss a single kernel, and the droppings are in the field where they should be. All the edible weeds will be added to the ration, and if dwarf Essex rape was sown in the field at the time of the last cultivating, so much the better. One acre of corn, raised from selected seed, should be sufficient to fatten ten hogs.

Why does the Eastern farmer pay so little attention to the hog industry?

Principally, because his attention has been so occupied with dairying that he has failed to realize the profit that may be had from hogs. If the Eastern farmer will erect suitable buildings, which must be warm, dry and well ventilated, and provide suitable pasture, he may add very materially to his profits. It possibly might mean a greater profit than he gets from his dairy and with comparatively no labor.

What causes sows to devour their young?

A lack of protein food in her rations. Often this can be prevented by giving the sow a good sized piece of fat pork on the day she is due to farrow.

What is a good ration for sows with pigs?

Wheat middlings	100 lbs.
Wheat bran	100 lbs.
Tankage	20 lbs.
Salt	2 lbs.

What protection should be provided for the young pigs in the pen?

Fasten around the farrowing pen a 1x6 board so that it will be 8 inches clear of the floor. Secure by nailing brackets above it. Push a little fine straw back under it and the young pigs will be safe from being crushed by their mother.

How should the pasture be arranged?

If possible, arrange pasture in two or more lots, so that the feed may be growing in one while the hogs are feeding in the other. Dwarf Essex rape will prove very satisfactory in the East. A small field of Jerusalem artichokes would be a great help in the fall.

HOG DON'TS.

- Don't try to get along without a good hog house.
- Don't have too small a pasture.
- Don't feed much corn to the brood sow.
- Don't give the brood sow anything for twenty-four hours after farrowing, except warm water.
- Don't feed anything sour to the young pigs.
- Don't let your hog house get filthy.
- Don't forget to see that your hogs have a clean, dry bed.
- Don't cook feed to fatten your hogs; give them corn in the ear and water.

GOVERNMENT LABOR BUREAUS.

What is the United States Government doing to supply laborers and to secure work for those out of employment?

The Department of Labor has divided the United States into districts, or "zones," and placed each in charge of one or more agents whose duty is not only to supply all kinds of help, male or female, but to secure work for those who seek it. The agents are really conducting free government labor bureaus and the operation of the system, as carried out, has been proving very satisfactory. Following are the different zones with their offices and sub-offices:

Zone 1, Maine, Massachusetts, Rhode Island. Principal office, Long Wharf, Boston, Mass.; sub-offices, Providence, R. I., Portland, Me., and New Bedford, Mass.

Zone 2, New York, New Jersey, Connecticut, New Hampshire and Vermont. Principal office, U. S. Barge Office, New York City; sub-offices, Buffalo, N. Y., Matawan, N. J.

Zone 3, Pennsylvania, Delaware, West Virginia. Principal office, 135 S. Second St., Philadelphia, Pa.; sub-office, Pittsburg, Pa.

Zone 4, Maryland. Office, Stewart Building, Baltimore, Md.

Zone 5, Virginia, North Carolina. Office, 119 W. Main St., Norfolk, Va.

Zone 6, Florida, Georgia, Alabama, South Carolina. Principal office, Federal Bldg., Jacksonville, Fla.; sub-offices, Savannah, Ga., Mobile and Birmingham, Ala., and Charleston, S. C.

Zone 7, Louisiana, Mississippi, Arkansas, Tennessee. Principal office, Immigration Station, New Orleans, La.; sub-offices, Gulfport, Miss., and Memphis, Tenn.

Zone 8, Texas and New Mexico. Principal office, Immigration Station, Galveston, Tex. Sub-offices, Albuquerque, N. Mex., Big Spring, Brownville, Laredo, Eagle Pass, San Antonio, Del Rio, El Paso, San Angelo and Amarillo, Tex.; Tucumcari and Deming, N. Mex.

Zone 9, Ohio and Kentucky. Office, Post Office Bldg., Cleveland, Ohio.

Zone 10, Illinois, Indiana, Michigan, Wisconsin. Office, 845 S. Wabash Ave., Chicago, Ill.

Zone 11, Minnesota, North Dakota, South Dakota. Office, Federal Bldg., Minneapolis, Minn.

Zone 12, Missouri, Kansas, Oklahoma, Iowa. Office, Chemical Bldg., St. Louis, Mo.

Zone 13, Colorado, Wyoming, Nebraska, Utah. Principal office, Central Savings Bank Bldg., Denver, Colo. Sub-offices, Salt Lake City, Utah.

Zone 14, Montana and Idaho. Principal office, Power Bldg., Helena, Mont. Sub-office, Moscow, Idaho.

Zone 15, Washington. Principal office, Rooms 208-210 Literary Bldg., Seattle, Wash. Sub-offices, Spokane, Walla Walla, Tacoma, Aberdeen, Everett, Bellingham, Port Angeles, Port Townsend, Claster, Lynden, Nooksack and Friday Harbor, Wash.

Zone 16, Oregon. Principal office, Railway Exchange Bldg., Portland, Ore. Sub-office, Astora, Ore.

Zone 17, Northern California and Nevada. Principal office, U. S. Appraiser's Bldg., San Francisco, Cal. Sub-offices, Fresno, Sacramento, Ureka and Monterey, Cal.

Zone 18, Southern California and Arizona. Principal office, Post Office Bldg., Los Angeles, Cal. Sub-offices, Douglas, Naco, Nogales, Phoenix, Yuma and Tucson, Ariz.; Indio, Calexico, San Bernardino, Backersfield, San Luis Obispo and San Diego, Cal.

How may I get assistance from a government bureau?

If near a bureau, call on the agent and tell him what you want. If at a distance from a bureau, ask your postmaster for a blank, an employer's blank, if you wish to employ help; a laborer's blank, if you are looking for work. Answer the questions carefully and truthfully and mail to the nearest office of the zone in which you reside, addressing it as follows: "Distribution Branch U. S. Immigration Service." For instance, if you are living at Centerville, N. Y., your letter would be addressed as follows:

Distribution Branch U. S. Immigration Service,
Buffalo, N. Y.

Must I advance railroad fare for the man the bureau sends me?

Sometimes it is necessary. In case it is advanced, the agent sees that the ticket is purchased and that the man takes the right train. He will also send you the man's baggage for security.

Must I accept anyone whom the bureau chooses to send?

Not if the qualifications have not been met. The agents study the farmer's requirements very carefully and seldom send men that do not fit.

Where may I obtain more information concerning the Government Labor Bureaus?

Address, Division of Information, Department of Labor, Washington, D. C.

GENERAL "DON'TS" FOR FARMERS.

Don't think you know it all.

Don't loaf on the job when work is to be done.

Don't deny the wife and children needed money or necessary pleasures.

Don't go half clothed or hungry, you can't do one half the work.

Don't try to save a penny, when the effort costs you a quarter.

Don't try to get along with toggled up harness and equipment when it is cheaper to use better equipment.

Don't buy stock or equipment because it is the cheapest, it may cost the most.

Don't let the wife get stoop-shouldered and gray at 45, over the wash board, buy her a washing machine.

Don't starve the cattle through the winter, they'll starve your family the year through.

Don't humiliate your family by driving a shabby buggy or a blind plug horse. Give the boys a good horse and carriage and they will stay by the farm.

Don't go to law.

Don't think your neighbor is all wrong and you are all right.

Don't carry a grouch.

Don't club the stock.

Don't tell the wife, "Make that hat do another year."

Don't stable your cows on the exposed side of a barn.

Don't swear or curse when things go wrong, laugh and keep cool.

Don't be unreasonable with the boys, the wife or the neighbors.

Don't fight out your grievances, talk them over.

Don't always take the other fellow's word, think for yourself.

Don't stay at home the year around, get acquainted around town, but don't become a loafer.

Don't sign papers for strangers.

Don't invest in mining stock, or other get-rich-quick schemes. Not one mining proposition in ten thousand succeeds, even though its promoters may be honest and sincere.

Don't forget to give your family a holiday now and then.

Don't let your yards be a receptacle for old rubbish and broken farm machinery.

Don't keep scrub stock, if you can afford better.

Don't forget that conveniences to lighten the work in the kitchen are just as essential as those at the barn.

Don't let your buildings assume a general air of shiftlessness and neglect.

Don't forget that a quick and efficient method of putting your farming tools out of commission is to leave them out doors.

Don't be stingy with oil.

Don't be bothered with inconveniences that may be remedied with a little labor and less money.

Don't live beyond your means; but don't think you have to deny yourself every luxury and pleasure until the farm is paid for. Enjoy yourself a little as you go along.

Don't put poor fruit in the middle of the package. It is this short-sighted policy that has done much to saddle upon the farmer the undesirable "thirty-five cent dollar."

Don't deed your farm to your children on their promise to provide for you during the rest of your life. The folly of this act has often been repented in sack cloth and ashes.

WHERE TO GO FOR ADVICE.

THE STATE EXPERIMENT STATIONS.

The experiment stations, although established primarily to conduct research work in agriculture, may be called upon for assistance in solving your farm problems. There is no charge for this service. Address all communications to Director of Experiment Station, at the place where the station is located. The following list gives, first the name of the State, next the town or postoffice where the station is located, followed by the name of the director or special agent in charge.

ALABAMA—College station, Auburn, J. F. Duggar; Canebrake station, Uniontown, L. H. Moore; Tuskegee station, Tuskegee Institute, G. W. Carver.

ALASKA—Sitka, C. C. Georgeson.

ARIZONA—Tucson, R. H. Forbes.

ARKANSAS — Fayetteville, M. Nelson.

CALIFORNIA—Berkeley, T. F. Hunt.

COLORADO—Fort Collins, C. P. Gillette.

CONNECTICUT — State station, New Haven; Storrs station, Storrs; E. H. Jenkins.

DELAWARE—Newark, H. Hayward.

FLORIDA — Gainesville, P. H. Rolfs.

GEORGIA—Experiment, R. J. H. De Loach.

GUAM—Island of Guam, A. C. Hartenbower.

HAWAII—Federal station, Honolulu, E. V. Wilcox; Sugar planters' station, Honolulu, H. P. Agee.

IDAHO—Moscow, J. S. Jones.

ILLINOIS—Urbana, E. Davenport.

INDIANA—La Fayette, A. Goss.

IOWA—Ames, C. F. Curtiss.

KANSAS—Manhattan, W. M. Jardine.

KENTUCKY—Lexington, J. H. Kastle.

LOUISIANA—State station, Baton Rouge; Sugar station, Audubon Park, New Orleans; North Louisiana station, Calhoun; W. R. Dodson.

MAINE—Orono, C. D. Woods.

MARYLAND—College Park, H. J. Patterson.

MASSACHUSETTS—Amherst, W. P. Brooks.

MICHIGAN—East Lansing, R. S. Shaw.

MINNESOTA — University farm, St. Paul; A. F. Woods.

MISSISSIPPI — Agricultural college, E. R. Lloyd.

MISSOURI—College station, Columbia; F. B. Mumford. Fruit station, Mountain Grove, Paul Evans.

MONTANA—Bozeman, F. B. Linfield.

NEBRASKA—Lincoln, E. A. Burnett.

NEVADA—Reno, S. D. Doten.

NEW HAMPSHIRE—Durham, J. C. Kendall.

NEW JERSEY—New Brunswick, J. G. Lipman.

NEW MEXICO—State college, Fabian Garcia.

NEW YORK—State station, Geneva, W. H. Jordan; Cornell station, Ithaca, B. T. Galloway.

NORTH CAROLINA—College station, West Raleigh; State station, Raleigh; B. W. Kilgore.

NORTH DAKOTA — Agricultural college, T. P. Cooper.

OHIO—Wooster, C. E. Thorne.

OKLAHOMA — Stillwater, L. L. Lewis.

OREGON—Corvallis, A. B. Cordley

PENNSYLVANIA—State college, R. L. Watts; State college, Institute of Animal Nutrition, H. P. Armsby.

THE STATE EXPERIMENT STATIONS—Continued.

PORTO RICO—Federal station, Mayaguez, D. W. May; Sugar planters' station, Rio Piedras, J. T. Crawley.

RHODE ISLAND—Kingston, B. L. Hartwell.

SOUTH CAROLINA—Clemson college, J. N. Harper.

SOUTH DAKOTA—Brookings, J. W. Wilson.

TENNESSEE—Knoxville, H. A. Morgan.

TEXAS — College station, B. Youngblood.

UTAH—Logan, E. D. Ball.

VERMONT — Burlington, J. L. Hills.

VIRGINIA — Blackburg, W. J. Schoene; Norfolk, truck station, T. C. Johnson.

WASHINGTON—Pullman, I. D. Cardiff.

WEST VIRGINIA—Morgantown, E. D. Sanderson.

WISCONSIN—Madison, H. L. Russell.

WYOMING — Laramie, H. G. Knight.

ADVICE FROM THE U. S. DEPARTMENT OF AGRICULTURE.

The various bureaus under the Department of Agriculture may be depended upon to supply information on their special line. For instance, if you desire information as to the identity and life history of a peculiar kind of bug that you have discovered preying upon one of your crops send a specimen to L. O. Howard, Bureau of Entomology, Washington, D. C. Following are the addresses of the different bureaus: Weather Bureau, G. F. Marvin, chief; Bureau of Animal Industry, A. D. Melvin, chief; Bureau of Plant Industry, W. A. Taylor, chief; Forest Service, H. S. Graves, forester; Bureau of Soils, Milton Whitney, chief; Bureau of Chemistry, C. L. Alsberg, chief; Bureau of Crop Estimates, L. M. Estabrook, statistician; Bureau of Entomology, L. O. Howard, entomologist; Bureau of Biological Survey, H. W. Henshaw, chief; Office of Public Roads, L. W. Page, director.

Many of the agricultural papers, notably *The Rural New Yorker*, *Country Gentleman*, and *The Fruit Grower*, will, through their staff of experts, answer free of charge, all questions sent to them by their subscribers.

FARMERS' BULLETINS.

Bulletins in this list will be sent free, so long as the supply lasts, to any resident of the United States, on application to his Senator, Representative, or Delegate in Congress, or to the Secretary of Agriculture, Washington, D. C. Because of the limited supply, applicants are urged to select only a few numbers, choosing those which are of special interest to them. The bulletins entitled "Experiment Station Work" give briefly the results of experiments performed by the State experiment stations.

22. The Feeding of Farm Animals.
30. Grape Diseases on the Pacific Coast.
34. Meats: Composition and Cooking.
36. Cotton Seed and Its Products.
44. Commercial Fertilizers.
48. The Manuring of Cotton.
51. Standard Varieties of Chickens.
54. Some Common Birds.
55. The Dairy Herd.
61. Asparagus Culture.
62. Marketing Farm Produce.
64. Ducks and Geese.
77. The Liming of Soils.
78. Experiment Station Work—V
79. Experiment Station Work—VI
81. Corn Culture in the South.
85. Fish as Food.
88. Alkali Lands.
97. Experiment Station Work—X.
99. Insect Enemies of Shade Trees.

101. Millets.
104. Notes on Frost.
106. Breeds of Dairy Cattle.
113. The Apple and How to Grow It.
120. Insects Affecting Tobacco.
121. Beans, Peas, and Other Legumes as Food.
127. Important Insecticides.
128. Eggs and Their Uses as Food.
134. Tree Planting on Rural School Grounds.
138. Irrigation in Field and Garden.
139. Emmer: A Grain for the Semiarid Regions.
140. Pineapple Growing.
142. Principles of Nutrition and Nutritive Value of Food.
152. Scabies of Cattle.
154. The Home Fruit Garden: Preparation and Care.

FARMERS' BULLETINS—Continued.

157. The Propagation of Plants.
158. How to Build Small Irrigation Ditches.
162. Experiment Station Work—XXI.
164. Rape as a Forage Crop.
166. Cheese Making on the Farm.
167. Cassava.
169. Experiment Station Work—XXII.
170. Principles of Horse Feeding.
172. Scale Insects and Mites on Citrus Trees.
173. Primer of Forestry. Part 1: The Forest.
174. Broom Corn.
175. Home Manufactured and Use of Unfermented Grape Juice.
176. Cranberry Culture.
178. Insects Injurious in Cranberry Culture.
179. Horseshoeing.
181. Pruning.
182. Poultry as Food.
183. Meat on the Farm: Butchering, Curing, and Keeping.
185. Beautifying the Home Grounds.
188. Weeds Used in Medicine.
190. Experiment Station Work—XXIV.
192. Barnyard Manure.
195. Annual Flowering Plants.
196. Usefulness of the American Toad
197. Importation of Game Birds and Eggs for Propagation.
198. Strawberries.
200. Turkeys.
203. Canned Fruits, Preserves, and Jellies.
204. The Cultivation of Mushrooms.
205. Pig Management.
206. Milk Fever and Its Treatment.
213. Raspberries.
218. The School Garden.
219. Lessons from the Grain Rust Epidemic of 1904.
220. Tomatoes.
221. Fungous Diseases of the Cranberry.
223. Miscellaneous Cotton Insects in Texas.
224. Canadian Field Peas.
229. The Production of Good Seed Corn.
232. Okra: Its Culture and Uses.
234. The Guinea Fowl.
238. Citrus Fruit Growing in the Gulf States.
239. The Corrosion of Fence Wire.
242. An Example of Model Farming.
243. Fungicides and Their Use in Preventing Diseases of Fruits.
245. Renovation of Worn-out Soils.
246. Saccharine Sorghums for Forage.
249. Cereal Breakfast Foods.
251. Experiment Station Work—XXXIV.
253. The Germination of Seed Corn.
254. Cucumbers.
255. The Home Vegetable Garden.
256. Preparation of Vegetables for the Table.
257. Soil Fertility.
263. Practical Information for Beginners in Irrigation.
264. The Brown-tail Moth and How to Control It.
266. Management of Soils to Conserve Moisture.
270. Modern Conveniences for the Farm Home.
271. Forage Crop Practices in Western Oregon and Western Washington.
272. A Successful Hog and Seed-corn Farm.
274. Flax Culture.
275. The Gipsy Moth and How to Control It.
276. Experiment Station Work—XXXIX.
277. The Use of Alcohol and Gasoline in Farm Engines.
278. Leguminous Crops for Green Manuring.
279. A Method of Eradicating Johnson Grass.
281. Experiment Station Work—XL.
282. Celery.
284. Insect and Fungous Enemies of the Grape East of the Rocky Mountains.
287. Poultry Management.
289. Beans.
290. The Cotton Bollworm.
291. Evaporation of Apples.
292. Cost of Filling Silos.
293. Use of Fruit as Food.
294. Farm Practice in the Columbia Basin Uplands.
295. Potatoes and Other Root Crops as Food.
298. Food Value of Corn and Corn Products.
301. Home-grown Tea.
302. Sea Island Cotton: Its Culture, Improvement and Diseases.
303. Corn Harvesting Machinery.
304. Growing and Curing Hops.
306. Dodder in Relation to Farm Seeds.
307. Roselle: Its Culture and Uses.
310. A Successful Alabama Diversification Farm.
311. Sand-clay and Burnt-clay Roads.
312. A Successful Southern Hay Farm.
313. Harvesting and Storing Corn.
318. Cowpeas.
322. Milo as a Dry-land Grain Crop.
323. Clover Farming on the Sandy Jack-pine Lands of the North.
324. Sweet Potatoes.
325. Small Farms in the Corn Belt.
326. Building up a Run-down Cotton Plantation.
328. Silver Fox Farming.
330. Deer Farming in the United States.
331. Forage Crops for Hogs in Kansas and Oklahoma.
332. Nuts and Their Uses as Food.
337. Cropping Systems for New England Dairy Farms.
338. Macadam Roads.
339. Alfalfa.
343. The Cultivation of Tobacco in Kentucky and Tennessee.
345. Some Common Disinfectants.
346. The Computation of Rations for Farm Animals by the Use of Energy Values.
347. The Repair of Farm Equipment.
349. The Dairy Industry in the South.
350. The Dehorning of Cattle.
351. The Tuberculin Test of Cattle for Tuberculosis.
354. Onion Culture.
355. A Successful Poultry and Dairy Farm.
358. A Primer of Forestry. Part II: Practical Forestry.
359. Canning Vegetables in the Home.
361. Meadow Rescue: Its Culture and Uses.
363. The Use of Milk as Food.
364. A Profitable Cotton Farm.
365. Farm Management in Northern Potato-growing Sections.
367. Lightning and Lightning Conductors

FARMERS' BULLETINS—Continued.

368. The Eradication of Bindweed, or Wild Morning-glory.
369. How to Destroy Rats.
370. Replanning a Farm for Profit.
371. Drainage of Irrigated Lands.
372. Soy Beans.
373. Irrigation of Alfalfa.
375. Care of Food in the Home.
377. Harmfulness of Headache Mixtures.
379. Hog Cholera.
380. The Loco-weed Disease.
382. The Adulteration of Forage-plant Seeds.
386. Potato Culture on Irrigated Farms of the West.
388. Experiment Station Work—LVI.
389. Bread and Bread Making.
390. Pheasant Raising in the United States.
391. Economical Use of Meat in the Home.
392. Irrigation of Sugar Beets.
393. Habit-forming Agents.
394. The Use of Windmills in Irrigation in the Semiarid West.
395. Sixty-day and Kherson Oats.
396. The Muskrat.
398. Farm Practice in the Use of Commercial Fertilizers in the South Atlantic States.
399. Irrigation of Grain.
400. A More Profitable Corn-planting Method.
401. The Protection of Orchards in the Pacific Northwest from Spring Frosts by Means of Fires and Smudges.
402. Canada Bluegrass: Its Culture and Uses.
403. The Construction of Concrete Fence Posts.
404. Irrigation of Orchards.
406. Soil Conservation.
407. The Potato as a Truck Crop.
411. Feeding Hogs in the South.
413. The Care of Milk and Its Use in the Home.
414. Corn Cultivation.
415. Seed Corn.
416. The Production of Cigar-leaf Tobacco in Pennsylvania.
417. Rice Culture.
420. Oats: Distribution and Uses.
421. Control of Blowing Soils.
422. Demonstration Work on Southern Farms.
424. Oats: Growing the Crop.
425. Experiment Station Work—LX.
426. Canning Peaches on the Farm.
427. Barley Culture in the Southern States.
428. Testing Farm Seeds in the Home and in the Rural School.
429. Industrial Alcohol: Sources and Manufacture.
431. The Peanut.
432. How a City Family Managed a Farm.
433. Cabbage.
434. The Home Production of Onion Seed and Sets.
435. Experiment Station Work—LXII.
436. Winter Oats for the South.
437. A System of Tenant Farming and Its Results.
438. Hog Houses.
439. Anthrax, with Special Reference to Its Suppression.
440. Spraying Peaches for the Control of Brown Rot Scab and Curculio.
441. Lespedeza, or Japan Clover.
442. The Treatment of Bee Diseases.
443. Barley: Growing the Crop.
444. Remedies and Preventives Against Mosquitoes.
445. Marketing Eggs Through the Creamery.
446. The Choice of Crops for Alkali Land.
447. Bees.
448. Better Grain-sorghum Crops.
449. Rabies or Hydrophobia.
450. Some Facts about Malaria.
452. Capons and Caponizing.
453. Danger of General Spread of the Gypsy and Brown-tail Moths Through Imported Nursery Stock.
454. A Successful New York Farm.
455. Red Clover.
456. Our Grosbeaks and Their Value to Agriculture.
458. The Best Two Sweet Sorghums for Forage.
459. House Flies.
460. Frames as a Factor in Truck Growing.
461. The Use of Concrete on the Farm.
462. The Utilization of Logged-off Land for Pasture in Western Oregon and Western Washington.
463. The Sanitary Privy.
464. The Eradication of Quack-grass.
466. Winter Emmer.
467. The Control of the Chestnut-bark Disease.
471. Grape Propagation, Pruning, and Training.
472. Systems of Farming in Central New Jersey.
473. Tuberculosis.
474. Use of Paint on the Farm.
475. Ice Houses.
476. The Dying of Pine in the Southern States: Cause, Extent and Remedy.
477. Sorghum-sirup Manufacture.
478. How to Prevent Typhoid Fever.
480. Practical Methods of Disinfecting Stables.
481. Concrete Construction on the Livestock Farm.
482. The Pear and How to Grow It.
483. The Thornless Prickly Pears.
485. Sweet Clover.
486. Experiment Station Work—LXVIII.
487. Cheese and Its Economical Uses in the Diet.
488. Diseases of Cabbage and Related Crops and Their Control.
489. Two Dangerous Imported Plant Diseases.
490. Bacteria in Milk.
491. The Profitable Management of the Small Apple Orchard on the General Farm.
492. The More Important Insect and Fungous Enemies of the Fruit and Foliage of the Apple.
493. The English Sparrow as a Pest.
494. Lawns and Lawn Soils.
495. Alfalfa Seed Production.
496. Raising Belgian Hares and Other Rabbits.
497. Some Common Game, Aquatic, and Rapacious Birds in Relation to Man.
498. Methods of Exterminating the Texas-fever Tick.
499. Experiment Station Work—LXIX.
500. The Control of the Boll Weevil.
501. Cotton Improvement Under Weevil Conditions.

FARMERS' BULLETINS—Continued.

502. Timothy Production on Irrigated Land in the Northwestern States.
503. Comb Honey.
504. Experiment Station Work—LXX.
505. Benefits of Improved Roads.
506. Food of Some Well-known Birds of Forest, Farm, and Garden.
507. The Smuts of Wheat, Oats, Barley, and Corn.
508. Market Hay.
509. Forage Crops for the Cotton Region.
511. Farm Bookkeeping.
512. The Boll Weevil Problem.
514. Experiment Station Work—LXXI.
515. Vetches.
516. The Production of Maple Sirup and Sugar.
517. Experiment Station Work—LXXII.
518. Winter Barley.
519. An Example of Intensive Farming in the Cotton Belt.
521. Canning Tomatoes at Home and in Club Work.
522. Experiment Station Work—LXXIII.
523. Tobacco Curing.
524. Tile Drainage on the Farm.
525. Raising Guinea Pigs.
526. Mutton and Its Value in the Diet.
528. Hints to Poultry Raisers.
529. Vetch Growing in the South Atlantic States.
530. Important Poultry Diseases.
531. Larkspur, or "Poison-Weed."
533. Good Seed Potatoes and How to Produce Them.
534. Durum Wheat.
535. Sugar and Its Value as Food.
536. Stock Poisoning Due to Scarcity of Food.
537. How to Grow an Acre of Corn.
538. Sites, Soils, and Varieties for Citrus Groves in the Gulf States.
539. Propagation of Citrus Trees in the Gulf States.
540. The Stable Fly.
541. Farm Buttermaking.
542. Culture, Fertilization, and Frost Protection of Citrus Groves in the Gulf States.
543. Common White Grubs.
544. Potato-tuber Diseases.
545. Controlling Canada Thistles.
546. How to Manage a Corn Crop in Kentucky and West Virginia.
547. The Yellow Fever Mosquito.
548. Storing and Marketing Sweet Potatoes.
550. Crimson Clover: Growing the Crop.
551. The Cultivation of American Ginseng.
552. Kafr as a Grain Crop.
553. Pop Corn for the Home.
554. Pop Corn for the Market.
555. Cotton Anthracnose and How to Control It.
557. The Potato Tuber Moth.
559. Use of Corn, Kafr, and Cowpeas in the Home.
561. Bean Growing in Eastern Washington and Oregon and Northern Idaho.
562. The Organization of Boys' and Girls' Poultry Clubs.
564. The Gipsy Moth and the Brown-tail Moth, with Suggestions for Their Control.
565. Corn Meal as a Food and Ways of Using It.
566. Boys' Pig Clubs.
577. Sugar-beet Growing Under Irrigation.
568. Sugar-beet Growing Under Humid Conditions.
569. Texas or Tick Fever.
571. Tobacco Culture.
572. A System of Farm Cost Accounting.
573. The Angora Goat.
574. Poultry House Construction.
576. Breeds of Sheep for the Farm.
577. Growing Egyptian Cotton in the Salt River Valley, Arizona.
578. The Handling and Feeding of Silage.
579. Crimson Corn.
580. Beef Production in the South.
582. Uses for Chestnut Timber Killed by the Bark Disease.
583. The Common Mole.
585. Natural and Artificial Incubation of Hens' Eggs.
586. Collection and Preservation of Plant Material for use in the Study of Agriculture.
587. Economic Value of North American Skunks.
588. Economical Cattle Feeding in the Corn Belt.
589. Homemade Silos.
591. The Classification and Grading of Cotton.
592. Stock Watering Places on Western Grazing Lands.
593. How to Use Farm Credit.
594. Shipping Eggs by Parcel Post.
595. Arsenate of Lead as an Insecticide Against the Tobacco Hornworms.
596. The Culture of Winter Wheat in the Eastern Half of the United States.
597. The Road Drag and How it is Used.
599. Pasture and Grain Crops for Hogs in Pacific Northwest.
600. An Outfit for Boring Taprooted Stumps for Blasting.
601. A New Method of Cotton Culture and Its Application.
602. Clean Milk: Production and Handling.
603. Arsenical Cattle Dips: Methods of Preparation and Directions for Use.
605. Sudan Grass.
606. Collection and Preservation of Insects and Other Material for Use in the Study of Agriculture.
607. The Farm Kitchen as a Workshop.
608. Removing Garlic Flavor from Milk and Cream.
609. Bird Houses and How to Build Them.
610. Wild Onion: Methods of Eradication.
612. Breeds of Beef Cattle.
613. Goldenseal under Cultivation.
614. An Efficient Farm System for the Corn Belt.
616. Winter-Wheat Varieties for the Eastern United States.
617. School Lessons on Corn.
618. Leaf-Spot, a Disease of the Sugar Beet.
619. Breeds of Draft Horses.
620. The Agricultural Outlook.
621. How to Attract Birds in Northeastern United States.
622. Basket Willow Culture.
623. Ice Houses and the Use of Ice on the Dairy Farm.
624. Natural and Artificial Brooding of Chickens.
625. Cotton Wilt and Root Knot.
626. The Carpet Beetle, or "Buffalo Moth."
627. The House Centipede.

FARMERS' BULLETINS—Continued.

- | | |
|--|---|
| 628. Game Laws for 1914. | 655. Cottonseed Meal for Feeding Beef Cattle. |
| 629. The Agricultural Outlook. | 656. The Community Egg Circle. |
| 630. Some Common Birds Useful to the Farmer. | 659. The True Clothes Moths. |
| 631. Growing Peaches: Sites, Propagation, Planting, Tillage, and Maintenance of Soil Fertility. | 661. A Method of Analysing the Farm Business. |
| 632. Growing Peaches: Pruning, Renewal of Tops, Thinning, Interplanted Crops, and Special Practices. | 664. Strawberry Growing in the South |
| 633. Growing Peaches: Varieties and Classification. | 666. Foot and Mouth Disease. |
| 638. Laboratory Exercises in Farm Mechanics for Agricultural Schools. | 669. Fiber Flax. |
| 643. Blackberry Culture. | 671. Harvest Mites, or "Chiggers." |
| 652. The Sheep-Killing Dog. | 672. The Agricultural Outlook. |
| 654. How Farmers May Improve Their Personal Credit. | 673. Irrigation Practice in Rice Growing. |
| | 675. The Roundheaded Apple-Tree Borer. |
| | 676. Hard Clover Seed and Its Treatment in Hulling. |
| | 678. Growing Hard Spring Wheat. |
| | 681. The Silverfish; an Injurious Household Insect. |

IDENTIFICATION OF FRUIT.

If there is, in your orchard, a tree bearing a strange variety of apples the name of which you are anxious to learn, write to C. P. Close, Bureau of Plant Industry, Washington, D. C., and ask him to mail you a few boxes for sending fruit for identification. He will send you boxes in which the fruit may be sent free of charge. There will be no charges for identification. It will make the identification easier if you send with the fruit a brief description of the tree.

LIVE STOCK REGISTRY ASSOCIATIONS.

Write to the secretaries, whose names are given, for addresses of reliable dealers nearest you.

HORSES.

- AMERICAN THOROUGHBRED STUD BOOK, J. E. Wheeler, 173 Fifth Ave., New York.
- AMERICAN HACKNEY STUD BOOK, Wm. S. Webb, 51 E. 44th St., New York.
- NATIONAL REGISTRY OF MORGAN HORSES, Jos. Battell, Middlebury, Vt.
- AMERICAN CLYDESDALE STUD BOOK, Charles F. Mills, Springfield, Ill.
- DOMINION CLYDESDALE STUD BOOK, Henry Wade, Toronto, Can.
- PERCHERON STUD BOOK OF AMERICA, S. D. Thompson, Wayne, Ill.
- AMERICAN FRENCH COACH HORSE SOCIETY, S. D. Thompson, Wayne, Ill.
- AMERICAN SHIRE HORSE ASSOCIATION, Charles Burgess, Winona, Ill.
- AMERICAN TROTTER REGISTER ASSOCIATION, J. H. Steiner, 355 Dearborn St., Chicago, Ill.
- AMERICAN JACK STUD BOOK, J. H. Felton, Grassland, Tenn.
- AMERICAN BELGIAN DRAFT HORSE ASSOCIATION, J. D. Conner, Jr., Wabash, Ind.
- AMERICAN SADDLE HORSE BREEDERS' ASSOCIATION, I. B. Nall, Louisville, Ky.
- AMERICAN SUFFOLK PUNCH ASSOCIATION, Alex. Galbraith, Janesville, Wis.
- NATIONAL REGISTRY OF NORMAN HORSES, Theo. Butterworth, Quincy, Ill.

(Addresses of other associations will be given on request.)

LIVE STOCK REGISTRY ASSOCIATIONS—Continued.**CATTLE.**

- AMERICAN ABERDEEN-ANGUS HERD BOOK, Thos. McFarlane, Harvey, Ill.
 AYRESHIRE RECORD, C. M. Winslow, Brandon, Vt.
 CANADIAN AYRESHIRE HERDBOOK, Henry Wade, Toronto, Can.
 AMERICAN GALLOWAY BREEDERS' ASSOCIATION, Frank B. Hearn, Independence, Mo.
 AMERICAN HEREFORD CATTLE BREEDERS' ASSOCIATION, C. R. Thomas, Independence, Mo.
 DOMINION HEREFORD HERD BOOK, Henry Wade, Toronto, Can.
 AMERICAN JERSEY CATTLE CLUB, R. M. Gow, 324 W. 23rd St., New York.
 THE HOLSTEIN-FRIESIAN ASSOCIATION OF AMERICA, F. L. Houghton, Brattleboro, Vt.
 HOLSTEIN-FRIESIAN HERD BOOK OF CANADA, J. W. Clemons, St. George, Can.
 DUTCH BELTED HERD BOOK, H. B. Richards, Easton, Pa.
 SWISS RECORD, N. S. Fish, Groton, Conn.
 AMERICAN DEVON RECORD, L. P. Sisson, Wheeling, W. Va.
 RED POLLED HERD BOOK, J. McLain Smith, Dayton, O.
 AMERICAN GUERNSEY CATTLE CLUB REGISTER, Wm. H. Caldwell, Peterboro, N. H.
 KERRY CATTLE, Henry S. Ambler, Chatham, N. Y.

(Addresses of other associations will be given on request.)

SHEEP.

- AMERICAN SHROPSHIRE SHEEP RECORD, Mortimer Levering, Lafayette, Ind.
 NATIONAL MERINO SHEEP REGISTRY ASSOCIATION, C. C. Johnson, Cannonsburg, Pa.
 REGISTER NEW YORK STATE AMERICAN MERINO SHEEP BREEDERS' ASSOCIATION, J. Horation Earll, Skaneateles, N. Y.
 REGISTER VERMONT MERINO SHEEP BREEDERS' ASSOCIATION, Lewis A. Skiff, Middlebury, Vt.
 OHIO MERINO SHEEP BREEDERS' ASSOCIATION, Wesley Bishop, Troyton, O.
 AMERICAN LEICESTER RECORD, A. J. Temple, Cameron, Ill.
 NATIONAL DELAINE MERINO SHEEP BREEDERS' ASSOCIATION, John C. McNary, Cannonsburg, Pa.
 NATIONAL LINCOLN SHEEP BREEDERS' ASSOCIATION, H. A. Daniels, Elva, Mich.
 FLOCK RECORD HAMPSHIRE-DOWN SHEEP, J. I. Gordon, Mercer, Pa.
 NATIONAL CHEVIOT SHEEP BREEDERS' ASSOCIATION, H. Keim, Ladoga, Ind.
 AMERICAN COTSWOOL RECORD, Geo. Harding & Son, Waukesha, Ind.
 AMERICAN RAMBOUILLET ASSOCIATION, E. V. Burnham, Woodstock, O.
 AMERICAN SOUTHDOWN RECORD, Jno. J. Springer, Springfield, Ill.

(Addresses of other associations will be given on request.)

TABLE I.

WEIGHTS AND MEASURES USED IN THE UNITED STATES.

Troy Weight.		Long Measure.	
24 grains	1 pwt.	12 inches	1 foot
20 pwt.	1 ounce	3 feet	1 yard
12 ounces	1 pound	5½ yards	1 rod
Used for weighing gold, silver, and jewels.		40 rods	1 furlong
		8 furlongs	1 statute mile
		3 miles	1 league
Apothecaries' Weight.		Paper Measure.	
20 grains	1 scruple	24 sheets	1 quire
3 scruples	1 dram	20 quires	1 ream (480 sheets)
8 drams	1 ounce	2 reams	1 bundle
12 ounces	1 pound	5 bundles	1 bale
The ounce and pound in this are the same as in Troy Weight.		Surveyors' Measure.	
		7.92 inches	1 link
		25 links	1 rod
		4 rods	1 chain
		10 sq. chains	or
		160 sq. rods	1 acre
		640 acres	1 sq. mile
		36 sq. miles (6 miles square)	1 township
Avoirdupois Weight.		Cubic Measure.	
27½ grains	1 dram	1,728 cubic in.	1 cubic foot
16 drams	1 ounce	27 cubic ft.	1 cubic yard
16 ounces	1 pound	128 cubic ft.	1 cord (wood)
25 pounds	1 quarter	40 cubic ft.	1 ton (shipping)
4 quarters	1 cwt.	2,150.42 cubic in.	1 standard bu.
2,000 pounds	1 short ton	231 cubic in.	1 standard gal.
2,240 pounds	1 long ton	1 cubic ft.	about ¾ bu.
Dry Measure.		Mariner's Measure.	
2 pints	1 quart	6 feet	1 fathom
8 quarts	1 peck	120 fathoms	1 cable length
4 pecks	1 bushel	7½ cable lengths	1 mile
36 bushels	1 chaldron	5,280 feet	1 statute mile
		6,085 feet	1 nautical mile
Liquid Measure.		Miscellaneous.	
4 gills	1 pint	3 inches	1 palm
2 pints	1 quart	4 inches	1 hand
4 quarts	1 gallon	6 inches	1 span
31½ gallons	1 barrel	18 inches	1 cubit
2 barrels	1 hogshead	21.8 inches	1 Bible cubit
		2.5 feet	1 military pace
Square Measure.			
144 square inches	1 sq. foot		
9 square feet	1 sq. yard		
30¼ square yards	1 sq. rod		
40 square rods	1 rood		
4 roods	1 acre		
640 acres	1 sq. mile		

TABLE II.

AVERAGE PERIOD OF INCUBATION.

Canary birds	14 days	Pea fowls	29 days
Ducks	28 days	Pheasants	25 days
Geese	30 days	Pigeons	18 days
Guinea	28 days	Turkeys	28 days
Hens	21 days		

AVERAGE PERIOD OF GESTATION

Ass	12 months	Goat	5 months
Bitch	9 weeks	Guinea pig	65 days
Camel	12 months	Mare	11 months
Cat	8 weeks	Pig	3½ months
Cow	9 months	Rabbit	30 days
Dog and fox.....	2 months	Rat and squirrel.....	28 days
Elephant	2 years	Sheep	5 months

AVERAGE LIFE OF ANIMALS.

Camel	100 years	Fox	15 years
Cat	15 years	Horse	20 years
Cow	20 years	Rabbit	7 years
Deer	20 years	Sheep	10 years
Dog	10 years	Swine	20 years

TABLE III.

NUMBER OF YEARS SEEDS RETAIN THEIR VITALITY

Barley	3	Oats	3
Beans	5	Onions	2
Beet	6	Orchard grass	2
Buckwheat	2	Parsnip	1
Cabbage	5	Peanut	1
Carrot	4	Peas	3
Celery	8	Pumpkin	5
Clover	3	Radish	5
Corn	2	Rape	5
Cucumbers	6	Rye	2
Eggplant	6	Salsify	2
Flax	2	Soy-beans	2
Hop	2	Squash	6
Lettuce	5	Timothy	2
Millet	2	Turnip	5
Muskmelon	5	Watermelon	6
Mustard	3	Wheat	2

TABLE III—Continued.
AMOUNT OF SEED PER ACRE.

Alfalfa (boardcast)	20-30 lbs.	Oats	2- 3 bus.
Alfalfa (drilled)	15-20 lbs.	Potatoes (cut)	8 bus.
Barley	8-10 pks.	Potatoes (whole)	12 bus.
Beans (small)	2- 3 pks.	Pumpkin	4 lbs.
Blue-grass (sown alone)	25 lbs.	Rape	2- 8 lbs.
Brome grass (sown alone)	12-20 lbs.	Red-top	12-15 lbs.
Buckwheat	3- 5 pks.	Rutabaga	3- 5 lbs.
Cabbage	$\frac{3}{4}$ - 1 lb.	Rye	3- 8 pks.
Carrot (for stock)	4- 6 lbs.	Sugar beets	15-20 lbs.
Clover (alsike alone)	8-15 lbs.	Sweet clover	2- 4 pks.
Clover (red alone)	10-18 lbs.	Timothy	10-20 lbs.
Corn (for ears)	6- 8 qts.	Timothy and Clover—	
Corn (for silage)	9-11 qts.	Timothy	10-15 lbs.
Cowpea	1-1 $\frac{1}{2}$ bu.	Clover	4-10 lbs.
Crimson clover (alone)	12-15 lbs.	Turnip (broadcast)	2- 4 lbs.
Flax	2- 4 pks.	Vetch (hairy) 1 bu. + 1 bu.	
Mangels	5- 8 lbs.	small grain.	
Millet	1- 3 pks.	Wheat	6- 9 pks.

TABLE IV.
NUMBER OF PLANTS PER ACRE AT VARIOUS DISTANCES.

Distance Inches.	Plants.	Distance Inches.	Plants.	Distance Feet.	Plants.	Distance Feet.	Plants.
1x 1	6,272,640	10x48	13,068	4x 5	2,178	9x10	484
1x 3	2,090,880	15x15	27,878	4x 6	1,815	9x11	440
1x 4	1,568,160	15x30	13,939	4x 7	1,556	9x12	403
1x 5	1,254,528	15x36	11,616	5x 5	1,742	10x10	435
2x 2	1,568,160	18x36	9,680	5x 6	1,452	10x12	363
2x 3	1,045,440	18x48	7,260	5x 7	1,244	10x15	290
2x 4	784,080			5x 8	1,089	10x18	242
2x 5	627,264	Feet.		5x 9	968	10x20	217
3x 3	696,960	1x 1	43,560	6x 6	1,210	12x12	302
3x 4	522,720	1x 2	21,780	6x 7	1,037	12x15	242
3x 5	418,176	1x 3	14,520	6x 8	907	12x20	181
4x 4	392,040	1x 4	10,890	6x 9	806	15x15	193
4x 5	313,632	1x 5	8,712	6x10	726	15x18	161
5x 5	250,905	2x 2	10,890	7x 7	888	15x20	145
6x 6	174,240	2x 3	7,260	7x 8	777	18x18	134
7x 7	128,013	2x 4	5,445	7x 9	691	18x20	121
8x 8	98,010	2x 5	4,356	7x10	622	18x24	100
9x 9	77,440	3x 3	4,840	8x 8	680	20x20	108
10x10	62,726	3x 4	3,630	8x 9	605	20x24	90
10x20	31,363	3x 5	2,904	8x10	544	20x30	72
10x24	26,136	3x 6	2,420	8x11	495	30x24	60
10x30	20,908	3x 7	2,074	8x12	453	30x30	48
10x36	16,424	4x 4	2,722	9x 9	537	30x36	40

TABLE V.

AVERAGE PERCENTAGE COMPOSITION OF FERTILIZER INGREDIENTS

Ingredients.	Nitrogen	Containing: or Phosphoric Potash		
		Ammonia	Acid	
Furnishing Nitrogen Principally:				
Sulphate of Ammonia, 98 per cent.....	20.	24.	....	....
Nitrate of Soda, 97 per cent.....	16.	19.	....	....
Dried Blood	13.	16.	5.	....
Fish Scrap	8.2	10.	8.†	....
Tankage	7.4	9.	11.†	....
Azotin	12.3	15.	7.	....
Cotton Seed Meal	7.	8.50	2.5*	1.8
Furnishing Potash Principally:				
Kainit .....	....	....	....	12.
Sylvinit .....	....	....	....	17.
Sulphate of Potash, High Grade (96 per cent.) .....	....	....	....	52.
Sulphate of Potash, Magnesia.....	....	....	....	....
(Double Manure Salt).....	....	....	....	27.
Muriate of Potash.....	....	....	....	50.
Wood Ashes (Hardwood, Unleached).....	....	....	2.	5.**
Cotton Seed Hull Ashes.....	....	....	9.	23.
Tobacco Stems	1.5	1.80	.75	5.
Furnishing Phosphoric Acid Principally:				
Acid Phosphate .....	....	....	10-14*	....
Dissolved Bone .....	....	2.	14.*	....
Bone Meal .....	....	4.	23.†	....
Bone Black .....	....	....	28.	....
Bone Ash .....	....	....	35.	....
Dissolved Bone Black.....	....	....	16.*	....

* Available Phosphoric Acid.

† Contains 4 per cent. Available Phosphoric Acid.

‡ Contains about 10 per cent. Available Phosphoric Acid.

** Contains about 33 per cent. of Lime.

TABLE VI.

THE AMOUNTS OF FERTILIZER INGREDIENTS (Potash, Phosphoric Acid and Nitrogen) PER ACRE USED BY DIFFERENT CROPS.

Crop	Yield	Straw, Etc.	Potash	Phosphoric	
				Acid	Nitrogen
Apples	15 tons	....	60 lbs.	30 lbs.	39 lbs.
Barley	30 bu.	2,000 lbs.	51 "	17 "	57 "
Beans	30 "	2,700 "	53 "	30 "	75 "
Buckwheat	34 "	2,800 "	40 "	14 "	56 "
Cabbage	30 tons	....	270 "	70 "	200 "
Clover, green*..	....	15 tons	140 "	40 "	130 "
Clover, dry ....	....	2 "	88 "	18 "	82 "
Corn	70 bu.	6,000 lbs.	55 "	48 "	83 "
Grapes	2 tons	7,000 "	39 "	11 "	32 "
Hops	600 lbs.	2,700 "	53 "	23 "	84 "
Mixed Hay.....	....	5,000 "	77 "	18 "	70 "
Oats	60 bu.	3,200 "	62 "	22 "	55 "
Onions	45,000 lbs.	....	72 "	37 "	72 "
Pears	16 tons	....	26 "	10 "	32 "
Peas	30 bu.	3,000 lbs.	52 "	33 "	108 "
Plums	8 tons	....	40 "	4 "	30 "

TABLE VI—Continued.

Crop	Yield	Straw, Etc.	Potash	Phosphoric Acid	Nitrogen
Potatoes	200 bu.	1,500 lbs.	74 "	21 "	46 "
Rye	30 "	4,250 "	45 "	26 "	51 "
Sugar Beets	15 tons	6,000 "	143 "	32 "	69 "
Timothy Hay ...	.....	4,000 "	94 "	23 "	89 "
Tobacco	1,600 lbs.	1,400 "	200 "	16 "	76 "
Tomatoes	10 tons	.....	54 "	20 "	32 "
Turnips	700 bu.	5 tons	180 "	52 "	80 "
Wheat	35 "	3,000 lbs.	31 "	24 "	59 "

** Contains about 83 per cent. of Lime.

TABLE VII.

AMOUNT OF FERTILIZING VALUE IN 1,000 POUNDS OF THE VARIOUS FARM PRODUCTS AND FOOD STUFFS.

Name of Feed	Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)	Potash (K ₂ O)
Alfalfa, green	7.7	1.3	5.6
Alfalfa, hay	26.1	6.1	17.9
Alsike (in bloom), green.....	6.2	1.1	2.0
Beets, sugar	2.9	0.8	3.7
Brewers' grains (dried)	40.0	16.1	2.0
Canada pea meal.....	32.3	8.2	9.9
Cotton seed meal.....	72.5	30.4	15.8
Corn ensilage	4.3	1.1	3.7
Corn fodder, green.....	2.9	1.1	3.9
Cornmeal (all)	14.7	6.3	4.7
Corn stalks with ears.....	7.2	5.4	8.9
Corn stalks without ears.....	6.1	3.8	10.9
Corn and cob meal.....	13.6	5.7	4.7
Cow peas, green.....	3.8	1.3	4.6
Crimson clover, hay.....	24.3	4.0	13.1
Dried beet pulp.....	12.9	2.2	3.1
Gluten meal	54.8	3.3	0.5
Kentucky blue grass, hay.....	12.5	4.0	15.7
Linseed meal (old process).....	54.2	16.6	13.7
Malt sprouts	42.1	17.4	19.9
Mangels	2.2	0.9	3.8
Oats	18.2	7.8	4.8
Oat forage, in bloom, green.....	2.6	1.3	3.8
Oat straw	5.8	3.0	17.7
Peas and oats, green.....	3.8	1.5	5.0
Red clover, green.....	7.0	1.5	4.8
Red clover, hay.....	19.7	5.5	18.7
Red top, hay.....	12.6	3.6	10.2
Ruta-bagas	1.9	1.2	4.9
Rye	18.1	8.6	5.8
Timothy, green	5.0	2.6	7.6
Timothy, hay	9.4	3.3	14.2
Wheat	19.0	5.5	8.7
Wheat bran (winter).....	25.1	26.9	15.2
Wheat middlings	27.0	26.3	15.3

TABLE VIII.
LEGAL WEIGHTS IN POUNDS PER BUSHEL.

	Apples	Barley	Beans	Blue-grass Seed	Bran	Buckwheat	Clover Seed	Corn	Corn in Ear	Corn Meal	Lime	Millet	Oats	Onions	Pears	Potatoes	Rye	Timothy	Wheat
United States	48	48	60	..	..	42	..	56	..	48	..	..	32	..	60	60	56	..	60
Alabama	..	47	60	..	..	..	..	56	70	46	..	..	32	..	60	60	56	..	..
Arizona	..	45	55	..	..	..	..	54	..	..	..	..	32	..	..	60	56	..	60
Arkansas	50	48	60	14	20	52	60	56	70	48	..	50	32	57	60	60	56	60	60
California	..	50	..	..	..	40	..	52	..	..	..	..	32	..	..	..	54	..	60
Colorado	..	48	60	14	..	52	60	56	70	50	80	..	32	57	..	60	56	45	60
Connecticut	48	48	60	..	20	48	60	56	..	..	70	..	32	52	60	60	56	45	60
Delaware	..	..	..	..	..	..	..	56	..	..	..	..	..	..	..	..	56	..	60
Florida	45	45	60	..	20	..	..	56	70	48	..	50	32	56	..	60	56	..	60
Georgia	..	47	60	14	20	52	60	56	70	48	80	..	32	57	60	60	56	45	60
Hawaii	..	48	..	..	..	..	..	56	..	..	..	..	32	..	..	..	56	..	60
Idaho	45	45	..	..	..	42	60	56	..	..	..	..	36	..	..	60	56	..	60
Illinois	..	45	60	14	20	52	60	56	70	48	80	..	32	57	..	60	56	45	60
Indiana	..	48	60	14	..	50	60	56	68a	50	..	50	32	48	..	60	56	45	60
Iowa	48	48	60	14	20	52	60	56	70	..	80	50	32	57	..	60	56	45	60
Kansas	48	48	60	14	20	50	60	56	70	50	80	50	32	57	..	60	56	45	60
Kentucky	..	47	60	14	20	56	60	56	68b	50	..	50	32	57	60	60	56	45	60
Louisiana	..	48	..	..	..	..	..	56	..	..	..	..	..	..	..	..	56	..	60
Maine	44	48	60	..	..	48	..	56	..	50	..	..	32	52	60	60	50	45	60
Maryland	..	..	..	..	..	..	..	..	..	..	..	..	26	..	..	56	..	..	..
Massachusetts	48	48	60	..	20	48	60	56	..	50	70	..	32	52	60	60	56	45	60
Michigan	48	48	60	14	..	48	60	56	70	50	70	50	32	54	60	60	56	45	60
Minnesota	50	48	60	14	..	50	60	56	70	..	80	48	32	52	60	60	56	45	60

TABLE VIII—Continued.
LEGAL WEIGHTS IN POUNDS PER BUSHEL.

	Apples	Barley	Beans	Blue-grass Seed	Bran	Buckwheat	Clover Seed	Corn	Corn in Ear	Corn Meal	Lime	Millet	Oats	Onions	Pears	Potatoes	Rye	Timothy	Wheat
Mississippi	..	48	60	14	20	48	60	56	72	48	80	50	32	57	60	60	56	45	60
Missouri	48	48	60	14	20	52	60	56	70	50	..	50	32	57	60	60	56	45	60
Montana	45	48	60	14	20	52	60	56	70	50	80	..	32	57	60	60	56	45	60
Nebraska	..	48	60	14	20	52	60	56	70	50	80	50	32	57	60	60	56	45	60
New Hampshire	..	..	62	..	..	..	..	56	..	56	..	..	32	..	60	60	56	..	60
New Jersey	50	48	60	..	..	50	64	56	..	..	..	..	30	57	60	60	56	..	60
New York	48	48	60	..	20	48	60	56	..	50	70	..	32	57	60	60	56	45	60
North Carolina	..	48	..	..	..	50	60	56	..	..	..	..	32	..	60	..	56	..	60
North Dakota	50	48	60	..	20	42	60	56	70	..	80	50	32	52	60	60	56	45	60
Ohio	50	48	60	..	..	50	60	56	80	..	70	50	32	55	60	60	56	45	60
Oklahoma	..	48	60	..	20	42	60	56	70	..	80	..	32	52	60	60	56	42	60
Oregon	45	46	..	..	..	42	60	56	..	..	..	..	32	..	..	60	56	..	60
Pennsylvania	..	47	..	..	..	48	60	56	..	..	..	..	32	50	..	60	56	..	60
Rhode Island	48	48	60	..	20	48	60	56	70	50	70	50	32	50	60	60	56	45	60
South Carolina	..	..	..	..	..	..	..	..	..	48	..	..	..	..	..	..	..	..	..
South Dakota	..	48	60	..	20	42	60	56	70	..	80	..	32	52	60	60	56	42	60
Tennessee	50	48	60	14	20	50	60	56	70	..	80	50	32	56	60	60	56	45	60
Texas	45	48	60	..	20	42	60	56	70	..	..	50	32	57	..	60	56	45	60
Vermont	46	48	62	..	..	48	60	56	..	..	..	..	32	52	60	60	56	45	60
Virginia	..	48	60	14	..	52	60	56	70	50	80	50	30	57	60	56	56	45	60
Washington	45	48	..	..	..	42	62	56	..	..	..	..	32	..	..	60	56	..	60
West Virginia	..	48	60	..	..	52	60	56	..	..	..	..	32	..	..	60	56	45	60
Wisconsin	50	48	60	..	20	50	60	56	..	50	70	50	32	57	60	60	56	45	60

TABLE IX.

DIGESTIBLE NUTRIENTS IN 100 POUNDS OF VARIOUS FEEDING STUFFS¹.

Kind of Feed	Pounds of Digestible Nutrients				Nutritive Ratio
	Total Dry Matter	Protein	Carbo- hydrates + (fat $\times$ 2.25)	Total	
Alfalfa, green.....	28.2	3.9	13.8	17.7	1: 3.5
Alfalfa hay	91.6	11.0	42.3	53.3	1: 3.8
Apples.....	19.0	.7	18.8	19.5	1:26.8
Apple pomace.....	23.3	1.1	16.4	17.5	1:14.9
Barley, grain.....	89.1	8.7	69.1	77.8	1: 7.9
Bean straw.....	95.0	3.6	39.7	43.3	1:11.0
Beet, mangel.....	9.1	1.1	5.6	6.7	1: 5.1
Beet, sugar.....	13.5	1.1	10.4	11.5	1: 9.4
Blood, dried.....	91.5	52.3	5.6	57.9	1: 0.1
Brewers' grains, dry.....	91.8	15.7	47.8	63.5	1: 3.0
Brewers' grains, wet.....	24.3	3.9	12.5	16.4	1: 3.2
Buckwheat bran.....	89.5	7.4	34.7	42.1	1: 4.7
Buckwheat, grain.....	87.4	7.7	53.3	61.0	1: 6.9
Buckwheat middlings.....	87.3	22.0	45.6	67.6	1: 2.1
Cabbage.....	15.3	1.8	9.1	10.9	1: 5.1
Carrot.....	11.4	.8	8.3	9.1	1:10.4
Clover (red), green.....	29.2	2.9	16.4	19.3	1: 5.7
Clover (red), hay.....	84.7	6.8	39.6	46.4	1: 5.8
Corn-and-cob meal.....	84.9	4.4	66.5	70.9	1:15.1
Corn fodder, green.....	20.7	1.0	12.5	13.5	1:12.5
Corn fodder, dry.....	57.8	2.5	37.3	39.8	1:14.9
Corn, grain.....	89.1	7.9	76.4	84.3	1: 9.7
Corn silage.....	20.9	.9	12.9	13.8	1:14.3
Corn stover.....	59.5	1.7	34.0	35.7	1:20.0
Cottonseed meal.....	91.8	37.2	44.4	81.6	1: 1.2
Cowpeas.....	85.2	18.3	56.7	75.0	1: 3.1
Gluten meal.....	91.8	25.8	68.1	93.9	1: 2.6
Hominy chops.....	88.9	7.5	70.5	78.0	1: 9.4
Hungarian hay.....	92.3	4.5	54.6	59.1	1:12.1
Linseed meal (new process).....	89.9	28.2	46.4	74.6	1: 1.6
Linseed meal (old process).....	90.8	29.3	48.5	77.8	1: 1.7
Malt sprouts.....	89.8	18.6	40.9	59.5	1: 2.2
Milk, cows'.....	12.8	3.6	13.2	16.8	1: 3.7
Skim-milk, centrifugal.....	9.4	2.9	5.9	8.8	1: 2.0
Skim-milk, gravity.....	9.6	3.1	6.5	9.6	1: 2.1
Butter milk.....	9.9	3.9	6.5	10.4	1: 1.7
Whey.....	6.6	0.8	5.4	6.2	1: 6.8
Hay of mixed grasses.....	87.1	5.9	43.6	49.5	1: 7.4
Oat straw.....	90.8	1.2	40.4	41.6	1:33.7
Oats, grain.....	89.0	9.2	56.8	66.0	1: 6.2
Peas, grain.....	89.5	16.8	53.4	70.2	1: 3.2
Peas-and-barley, green.....	16.0	1.7	7.7	9.4	1: 4.5
Peas-and-oats, green.....	16.0	1.8	7.6	9.4	1: 4.2
Pea-vine straw.....	86.4	4.3	34.1	38.4	1: 7.9
Pea-vine silage.....	27.0	2.5	14.1	16.6	1: 5.6
Potatoes.....	21.1	.9	16.5	17.4	1:18.3
Pumpkin, field.....	19.1	1.4	6.5	7.9	1: 4.6
Rye, grain.....	88.4	9.9	70.1	80.0	1: 7.1
Rye bran.....	88.4	11.5	54.8	66.3	1: 4.8
Rye straw.....	92.9	.6	41.5	42.1	1:69.2
Soy-bean.....	89.2	29.6	54.7	84.3	1: 1.8
Sugar-beet leaves.....	12.0	1.7	5.1	6.8	1: 3.0
Sugar-beet molasses.....	79.2	9.1	59.5	68.6	1: 6.5

TABLE IX—Continued.

Kind of Feed	Total Dry Matter	Pounds of Digestible Nutrients			Nutritive Ratio
		Protein	Carbo-hydrates + (fat $\times$ 2.25)	Total	
Sugar-beet pulp.....	10.2	.6	7.3	7.9	1:12.2
Timothy hay.....	86.8	2.8	46.6	49.4	1:16.6
Turnip, flat.....	9.5	1.0	7.7	8.7	1: 7.7
Wheat, grain.....	89.5	10.2	73.0	83.2	1: 7.2
Wheat bran.....	88.1	12.2	45.3	57.5	1: 3.7
Wheat middlings.....	87.9	12.8	60.7	73.5	1: 4.7
Wheat straw.....	90.4	.4	37.2	37.6	1:93.0

¹Adapted from Henry's Feeds and Feeding.

TABLE X.**USEFUL RULES.****TO FIND THE NUMBER OF BUSHEL IN A BIN.**

Multiply the product of the length, breadth and thickness, in feet, by 45/56.

TO MEASURE LUMBER.

Multiply together the number of pieces, the width and thickness in inches, the length in feet and divide the product by 12.

TO FIND THE NUMBER OF TONS OF HAY IN A BAY.

From the top down 400 cubic feet will make a ton. Multiply length, breadth and thickness in feet together and divide by 400. After the hay has settled several months, the part of the mow ten feet below the surface will average a ton to 270 cubic feet. If clover hay, increase bulk by one-tenth.

TO FIND THE NUMBER OF TONS IN A STACK.

Multiply the length in feet by the width in feet, this product by one-half the height, and divide by 300. If a round stack, multiply the area of the base by one-half the height and divide by 300.

TO FIND THE NUMBER OF BUSHEL OF CORN IN A CRIB.

Allow $2\frac{3}{4}$ cubic feet for a bushel of corn on the cob. It requires two bushels of ear corn to make one bushel of shelled corn.

HOW TO FIND THE AREA OF A CIRCLE.

Square the diameter (multiply it by itself) and multiply by .7854.

TO FIND THE CAPACITY OF A WATERING TROUGH.

Multiply the length, width and depth in feet together and divide the product by 4. The result will be the contents in barrels of $31\frac{1}{2}$ gallons each.

TO FIND THE CONTENTS OF A ROUND TANK.

Multiply the square of the diameter in feet by the depth in feet and the result by 6. The result is the approximate contents of the tank in gallons.

FUNGICIDES AND INSECTICIDES.

Many of these preparations may be purchased of local dealers; but if large quantities are to be used, it will be cheaper to make your own.

Lime-Sulphur.

For the San José Scale and to Prevent Disease.

Flowers of sulphur	15 pounds
Quick lime	15 pounds
Water	50 gallons

Slake the lime and mix it with sulphur, adding water enough to make a soft paste. Add 10 gallons of water and boil for about an hour, or until the mixture is well dissolved. Then add water to make 50 gallons and use while warm. This will prevent peach leaf curl.

Commercial lime-sulphur should be diluted with nine to ten times its bulk of water.

Self-Boiled Lime-Sulphur.

For Cherries, Pears and Peaches.

Fresh burned lime	8 pounds
Flowers of sulphur	8 pounds
Water	50 gallons

Place lime in a barrel and add a little water. As soon as it begins to slake add the sulphur. Keep stirring constantly and adding water until the mixture reaches the consistency of a thin paste. The lime will generate enough heat to boil several minutes. When the lime is well slaked, add water to cool the mixture and prevent further cooking. When cool strain through a 20-mesh sieve, forcing the sulphur through, but keeping out the chunks of lime. Dilute to 50 gallons. This is used as a summer spray. It is said to prevent brown rot in peaches.

Bordeaux Mixture.

For All Fungus Diseases.

Copper sulphate (blue vitriol)	5 pounds
Unslaked lime	5 pounds
Water	50 gallons

Place the copper sulphate in a gunny sack, or tie in cheese cloth, and hang in twenty gallons of water in such a way that the bottom of the sack will rest on top of the water. This will permit the air to come in contact with the vitriol and help to dissolve it. Pour about three gallons of hot water on the lime and stir until it is thoroughly slaked. Strain this through a cheese cloth into the water containing the dissolved sulphate and add water to make fifty gallons. This is what is known as the 5-5-50 solution and is used on apple trees in the spring before the buds start. The two solutions should not be mixed until used, and one must always be very dilute when they are mixed.

Often what is known as "stock solutions" are made by dissolving the lime and sulphate separately at the rate of one pound to each gallon of water. When needed one gallon each of the solution is taken for each ten gallons of water to be used.

Care should be taken that enough lime is used. A test may be made by dissolving a little potassium ferrocyanide in water and pouring a few drops into the Bordeaux mixture. If enough lime is present, the color will remain yellow, if more is needed the color will change to a brick red.

Dry Paris Green.

To Kill Potato Bugs.

Paris green	1 pound
Hydrated lime	20 pounds

This may be used for dusting potatoes when it is not convenient to spray.

Kerosene Emulsion.

Hard soap	$\frac{1}{2}$ pound
Rain water	1 gallon
Kerosene (coal oil)	2 gallons

Shave the soap, dissolve in hot water and add to the oil while hot, away from the fire. Churn with a pump for 5 minutes, or until the mixture increases from one-third to one-half its bulk and assumes the consistency of cream.

For plant lice and other soft-bodied insects dilute with 15 parts of water. For the red spider and other plant mites dilute the same and add 1 ounce of flowers of sulphur to the gallon. Apply with a spray pump and do not dilute until used.

Tobacco Solution.

For Plant Lice.

One pound of tobacco stems to about a gallon of water soaked over night, or one part of "Black leaf" extract to 40 parts of water.

Poisoned Bait.

For Cut Worms or Army Worms.

Paris green	$\frac{1}{2}$ pound
Bran	25 pounds
Water	2 gallons
Cheap Molasses	$1\frac{1}{2}$ quarts

If necessary, add water to make the mixture moist throughout, but not sloppy. Scatter in little fingerfuls on ground infested by worms. Do not put it where the hens can get it.

Hellebore.

For Currant and Gooseberry Worms.

Fresh white hellebore.....	6 ounces
Water	3 gallons

Apply with a spray pump. If for dry application, 1 part of the hellebore may be used to 5 of hydrated lime.

For Cabbage Worms.

Sift rye flour on the plants in the morning while the dew is on. Good commercial preparations to use are, "Slug Shot" and "Bug Death," sold at most drug stores and seed houses.

Tarred Seed Corn.

To Prevent Crows and Blackbirds from Pulling Up.

Put the corn into a pail and pour on enough warm water to cover it. Add a tablespoonful of tar to the peek, and stir thoroughly. Place the corn on a sieve or in a basket to drain and then stir in a few handfuls of slaked lime, road dust or land-plaster. Do not pour tar on the dry seed. As a further preventive against wireworms, enough Paris green may be stirred in to give the corn a faint green color.

Formaldehyde.

For Oat Smut, Stinking Smut of Wheat and Scabby Potatoes.

Formaldehyde	1 pint
Water	50 gallons

Smut is caused by a fungus which is carried over from one crop to another by means of germs or spores which cling to the outside of the seed kernels. When the seeds grow the fungus grows inside the tissues of the plant. Later, when the plant blooms, the fungus takes possession and produces black, dusty spores where the grain kernels should be. Treat as follows:

Spread the seed out on a floor or canvas and sprinkle with the solution until moist, but not wet enough to pack in the hand. Shovel over repeatedly to distribute the moisture evenly, then shovel into a pile and cover with sacks or canvas for at least two hours. The seed may then be sown at once or may stand until the next day. If kept longer the grain should be dried as rapidly as possible by spreading it out into a thin layer and stirring occasionally with a rake. Avoid reinfection with smut from smutty sacks, bins, wagon boxes, or seeders. Give them the formaldehyde treatment also. The solution may be mixed in a barrel and applied with a sprinkling can. Each gallon of this solution is enough for a little more than one bushel of grain.

When treating potatoes, use 30 gallons of water, instead of 50, and soak seed for two hours. This should be done before the sprouts start.

USEFUL FORMULAS.*A Good Spray for the Hen House.*

Crude carbolic acid	1 part
Kerosene oil	3 parts

Clean up all droppings and litter and spray thoroughly, in the cracks and under the roosts. It will clean out all lice, mites and fleas.

For Killing Lice on Cattle and Young Stock—No. 1.

Linseed oil	1 gallon
Lard compound	5 pounds
Flowers of sulphur	5 pounds
Kerosene oil	2 quarts

Grease the stock all over with this ointment and every louse will be killed. Repeat in ten days to destroy the new crop.

For Killing Lice on Cattle and Young Stock—No. 2.

Soft soap	4 quarts
Kerosene oil	1 pint
Water	6 quarts

Churn well together and wash the animals thoroughly. Repeat as with No. 1.

An Excellent Lice Powder for Poultry.

Crude carbolic acid	1/2 pint
Gasoline.	1 1/2 pints
Plaster of Paris	5 pounds

Mix thoroughly and rub through a fine sieve. Let stand for one day before using. Do not use this powder on young chicks.

Government Whitewash.

1. **WHITEWASH FOR OUTSIDE USE**—(1) Slake 1 bushel of quicklime in 12 gallons of hot water; (2) dissolve two pounds of common salt and 1 pound of sulphate of zinc in 2 gallons of boiling water; pour (2) into (1), then add 2 gallons of skim milk and mix thoroughly. Whitewash is spread lightly over the surface with a broad brush.

2. **WHITEWASH FOR INTERIOR PAINTING**—Slake a peck of quicklime with boiling water and cover the instant the water is added. Strain after slaking, and put in a gallon of salt dissolved in hot water, a quarter of a pound of Spanish whiting, two pounds of rice-paste, and a half-pound of glue, dissolved in warm water. Mix these thoroughly, cover, and set aside for a few days to ripen.

If this is made thin enough, it may be sprayed on fences, nests, troughs, hen-coops, poultry-houses and walls. If a spray-pump is used two or three coats should be put on. No mice, vermin or lice can live where this wash is used.

Grafting Wax for Warm Weather—No. 1.

Resin	4 ounces
Beeswax	2 ounces
Tallow	1 ounce

Use the above proportion to make the amount needed. Melt together stir and pour into a pail of cold water. Grease the hands and pull the wax until it is nearly white. Work into sticks and put in a cool place.

Grafting Wax for Cool Weather—No. 2.

Resin	5 pounds
Beeswax	1 pound
Linseed oil	1 pint

Prepare same as No. 1.

Egg Preservative.

Water glass solution	1 gallon
Water.	9 gallons

First boil and cool the water then add the water glass. Use stone jars. Place the eggs in the solution from day to day, as they are laid, taking care that they are absolutely clean. If placed in a cool, dark place, eggs will remain fresh in this solution for one year. Infertile eggs will keep longer than fertile eggs.

The Washington Experiment Station gives the following figures as to size of container and number of eggs:

<i>Size of Container</i>	<i>Will Hold</i>	<i>Size of Container</i>	<i>Will Hold</i>
1 gallon....	40 eggs	4 gallon....	160 eggs
2 gallon....	80 eggs	5 gallon....	200 eggs
3 gallon....	120 eggs	10 gallon....	400 eggs

HOW TO REMOVE STAINS.

Black Silk—Brush and wipe it thoroughly; lay on table with the side intended to show, up; sponge with hot coffee strained through muslin; when partly dry, iron.

To Remove Stains or Grease From Oil Paint—Use bisulphide of carbon, spirits of turpentine, or if dry and old, use chloroform. These and tar spots can be softened with olive oil and lard.

Iron Rust—Warm 10 per cent solution of oxalic or citric acid. Do not use on silk; sour milk may also be used.

Rust From Steel—Mix a half-ounce of emery powder with one ounce of soap and rub well.

Fruit Stains From Cotton—Apply cold soap, then touch the spot with a feather or fine brush dipped in chlorate of soda, then dip immediately in cold water. Alcohol is often very efficient.

Grease From Silk—Moisten the spot and rub with magnesia, let it dry, then brush the powder off.

Scorch Stains From White Linen—Lay in bright sun.

Mildew—Rub a little soap over the milder spots, and over this a little chalk and lemon juice, place the garment in the sun for two hours and wash in the usual way.

Fruit Stains on the Hands—Moisten the hands and hold them over burning sulphur; if vegetable stains, rub with a slice of raw potato.

Indelible Inks—A 10 per cent solution of potassium cyanide, *very poisonous*.

Iodine—Wood alcohol, 10 per cent solution of potassium iodide.

Tar, Wagon Grease—Soap and oil, turpentine.

Paint, Varnish—Turpentine, benzine, carbon tetrachloride. Do not use turpentine on silk.

Oil Marks on Wall Paper—Apply paste of cold water and pipe clay, leave it on all night, brush off in the morning.

Paint Spots From Clothing—Saturate with equal parts turpentine and spirits of ammonia.

To Cleanse House Paper—Rub with flannel dipped in oatmeal.

Black Cloth—Mix one part of spirits of ammonia with three parts warm water; rub with sponge or dark cloth; clean with water; rub with the nap.

Furniture—For Finger Marks, Rub with a soft rag and sweet oil.

Chromos—Go over lightly with a damp linen cloth.

Zinc—Rub with a piece of cotton cloth dipped in kerosene, afterwards with a dry cloth.

Window Glass—Paint can be removed by a strong solution of soda.

To Clean Tinware—Common soda, applied with a moistened newspaper and polished with a dry piece, will make it look like new.

To Cleanse the Coffee Pot—Boil in it water in which soda has been dissolved.

Chloroform will often restore the color in colored goods.

TESTED RECIPES

SALT-RISING BREAD.

Put 2 tablespoons of corn meal into a glass with a fitted cover (use a small-sized dried-beef glass) and add a bit of soda about one-half as large as a small pea. Pour over this enough scalded milk, which has become partially cooled, to make a thin batter. It should fill the cup about one-half full. Stir while the milk is being poured in, and place in a covered dish containing warm water and set where it will keep at an even temperature just a little below scalding heat. It should become light in six hours, and is then known as "railroad emptyings." It may now be set away until ready for use. It will keep for several days, if kept cool.

For 4 loaves of bread, put 1 cup of flour into a bread pan and pour over it, stirring constantly to avoid lumps, 1 cup of scalded milk, hot, and enough boiling water to thoroughly wet the entire mass. Stir until perfectly smooth, then add about 2 cups of cold water and enough flour to make a soft batter. Stir into this, which should now be about luke warm, three teaspoons of the emptyings, place the bread pan in a larger pan of warm water and set where it will keep warm, but not hot. **Avoid drafts.** When about double in bulk add 2 teaspoons of salt and sufficient flour to make into soft loaves with a small amount of kneading (mixing). Set in a warm place and let rise again until about double in bulk, then bake in a moderate oven.

ROLLS.

Pour 1 pint of boiled milk over a scant half-cup of shortening (half butter and half lard). Add a half-cup of sugar, and when cold, 1 compressed yeast cake dissolved in a little water. Thicken as for bread sponge. Let rise and knead into soft loaf, adding one-half teaspoon salt at this time. Let rise again. When light knead very little, and roll out one inch thick. Butter and sprinkle very lightly with flour; cut with cookie cutter and pinch edges together; let get very light. Bake in moderate oven for about 15 minutes. Start at nine or ten in the morning for use at night. Let rise on side table, unless severe cold weather, when place near stove.

GRAHAM BREAD.

One-half cup New Orleans molasses, $\frac{1}{2}$ cup granulated sugar, 2 cups graham flour, 2 cups white flour, 2 cups sour milk, or butter milk, 1 scant teaspoon soda, 1 teaspoon salt. Stir well and bake one hour in a moderate oven. This makes two small loaves.

MUFFINS.

One egg, 1 cup sweet milk, 2 tablespoons sugar, $\frac{1}{2}$ cup melted butter, 2 cups flour before sifting, 3 teaspoons baking powder and $\frac{1}{4}$ teaspoon salt. Beat until light and bake in quick oven, about 20 minutes.

BAKING POWDER BISCUITS.

One and one-half cups flour, $1\frac{1}{2}$ teaspoons baking powder, 1 tablespoon of lard, $\frac{1}{2}$ teaspoon salt. Add sufficient flour to make a soft dough and roll to about one inch thick. Cut in desired shape and bake in quick oven. This may also be used for shortcakes and for dumplings.

WHEAT GRIDDLE CAKES.

Two and one-half cups sifted flour, $\frac{1}{2}$ teaspoon salt, 2 cups sour milk, $1\frac{1}{4}$ teaspoon soda, 1 egg. Mix and sift flour, salt and soda; add sour milk, and egg well beaten. Drop by spoonfuls on greased, hot griddled. Cook on one side. When puffed full of bubbles and cooked on edges, turn and cook other side.

BUCKWHEAT GRIDDLE CAKES. NO. 1.

Two cups buttermilk, 1 cup water, 2 teaspoons soda, salt. Add flour to make batter of right consistency. Mix at night, and add soda in the morning.

BUCKWHEAT GRIDDLE CAKES. NO. 2.

One heaping cup buckwheat flour, $\frac{2}{3}$ cup white flour, $\frac{2}{3}$ cup sour milk, $\frac{1}{2}$ cup water, salt. Mix and add yeast cake dissolved in water. Start at night, adding even teaspoon of soda and the salt in the morning. Before adding soda in the morning take out $\frac{2}{3}$ cup of batter to start the next batch. No more yeast need be added.

CORN BREAD.

Two cups sour milk, $\frac{3}{4}$ or $\frac{1}{2}$ cup sugar, 2 cups corn meal, 1 cup white flour, large teaspoon soda dissolved in milk, salt. Steam three hours.

FRIED CAKES.

One cup thick sour milk, not too old, 1 cup sugar, 2 eggs, 2 level tablespoons butter, 1 level tablespoon lard (both melted), 1 level teaspoon soda, 1 heaping teaspoon baking powder, a dash of nutmeg and cinnamon, more of the latter, salt. Cream butter, lard and sugar together and, when cool, add eggs and beat well. Add flour and lastly the milk. Put soda in the milk and sift baking powder with the flour. Knead on board until smooth, being careful not to get too thick. Roll to about an inch thick; cut in rings and fry in hot fat.

PLAIN CAKE.

One cup sugar, 1 egg, rounding tablespoon soft butter, 1 cup sweet milk, 2 cups sifted flour, 2 heaping teaspoons baking powder. If short of milk, half water may be used. Cream butter and sugar together, add egg and beat well; add flour, in which the baking powder has been mixed, salt and milk. Beat thoroughly and bake in medium-sized bread tin.

LAYER CAKE.

One cup sugar and 2 eggs beaten to a cream; 4 tablespoons melted butter, beat thoroughly. Add 1 cup sweet milk, 2 heaping teaspoons baking powder, sifted through 2 cups flour, pinch of salt, 1 teaspoon vanilla; makes two large layers, or three smaller ones.

PIE CRUST.

One cup flour, 2 large tablespoons lard, 3 tablespoons water, salt. Work the lard into the flour thoroughly, add the water and work gently with the hands shaping it into a form for rolling. When a stiff dough is formed, turn on a floured board, pat with a rolling pin and roll into a thin piece.

CUSTARD PIE.

Two eggs, beaten, $\frac{2}{3}$ cup sugar, 1 rounding tablespoon flour, a little salt and nutmeg. Smooth the flour and nutmeg in a little milk; put all ingredients into a pint bowl and fill with milk. This makes filling for one pie. Bake in raw crust.

LEMON PIE.

One cup sugar, 1 tablespoon butter, 1 tablespoon corn starch, 1 cup boiling water, 2 eggs, 1 lemon. Cream butter and sugar, moisten starch with cold water and then add the boiling water; pour this over the butter and sugar and let cool, then add the beaten eggs and lemon juice with a little of the grated rind.

PUMPKIN PIE.

Steam or stew the pumpkin, cut into small pieces, until soft enough to mash with a potato masher. Return it to the fire to let the water dry off, taking care that it does not burn or scorch. For one pie take 1 well beaten egg, $\frac{1}{2}$ cup of brown sugar, 1 cup pumpkin, 1 cup rich milk (a little cream improves it) and a pinch of salt. Stir well together, season with $\frac{1}{2}$ teaspoon ginger and bake with undercrust in a moderately hot oven.

RHUBARB PIE.

One large cup chopped pie plant, 1 large cup sugar, 1 egg, the grated rind and juice of 1 lemon, 1 teaspoon flour. Stir all together and bake between two crusts.

CAKE FILLING. NO. 1.

Two-thirds cup sugar, $1\frac{1}{2}$ tablespoons corn starch; pour over this 1 small cup boiling water and cook 5 minutes; add rind and juice of one lemon, yolks of 2 eggs, 1 tablespoon butter and cook one minute.

CAKE FILLING. NO. 2.

One-half cup sugar, $\frac{1}{2}$ cup sweet milk, 2 teaspoons flour, yolks of 2 eggs, heaping teaspoon butter, teaspoon vanilla, $\frac{1}{2}$ cup chopped nut meats. Cook in double boiler until it thickens.

GINGER COOKIES.

One cup sugar, 1 cup Duff's molasses, 1 cup lard, 1 cup sour milk, 2 teaspoons soda, 1 teaspoon ginger, 1 teaspoon cinnamon, 1 even teaspoon salt, 1 egg. Put all ingredients in dish together and stir; mix soft and bake in quick oven.

SUGAR COOKIES.

One and one-half cups sugar, 1 cup sour cream, butter the size of an egg, 1 egg, 1 teaspoon soda. Mix soft and bake quickly.

GINGER BREAD.

One-half cup sugar, $\frac{1}{2}$ cup lard, 1 cup molasses, $2\frac{1}{2}$ cups flour, 2 eggs, 1 cup boiling water, 1 teaspoon each of soda, ginger, cinnamon and cloves. Beat the eggs, add sugar, lard and molasses; cream them, then add flour, soda and spices and last of all the boiling water. Bake in a long pan in a moderate oven.

SPONGE CAKE.

To 7 eggs take half a pound of flour and $\frac{3}{4}$ of a pound of sugar and the juice and grated rind of a lemon. Pour over the sugar a half-cupful of boiling water and let it boil. Beat whites and yolks of egg well together, and when sugar is boiled to a clear syrup, pour it over them, beating the whole until it is thick and light. Stir in the flour lightly and add the lemon last of all. Bake in a slow oven.

BEEF STEAK STEW.

Cut 1 pound of medium thick round steak into pieces about 2 inches square; place in bottom of a 3-quart basin, drop bits of butter over the pieces, then add alternate layers of onions and sliced po-

tatoes, scattering a little flour and salt over each layer. Put a generous supply of butter on top. The dish may be filled to within 1 inch of the top. Pour on boiling water; cover tightly and bake slowly for about 5 hours. Fresh, or canned tomatoes, may be added, if desired.

BEEF AND VEGETABLE STEW.

Cut potatoes, carrots, turnips and any other vegetable desired into small dice and boil until tender in broth in which beef has been boiled; add bits of cooked meat, season with salt and pepper, heat and serve. If the meat was salted when cooked, only a small amount of salt need be added.

MINCE MEAT.

One quart ground beef, which has been thoroughly cooked, 2 quarts sour apples (Greenings preferred), 2 teacups beef suet, ground very fine, 1 pound raisins, 1 teacup English currants, 1 pint black molasses, 1 pound brown sugar, 1 pound granulated sugar, 1 quart sour cider, 1 pint boiled cider, or apple jelly, 1 teaspoon salt, 1 teaspoon cloves, 1 tablespoon cinnamon, 1 grated nutmeg. The raisins should be seeded and ground, the English currants thoroughly washed and ground. Mix together, cook thoroughly and can hot, as fruit.

MOCK MINCE MEAT.

One peck green tomatoes, 1 peck sour apples, 5 pounds sugar, half brown, half granulated, 1 pound raisins, 1 pound English currants, 2 tablespoons cinnamon, 1 tablespoon cloves, 1 tablespoon nutmeg, 2 cups vinegar or boiled cider, 2 cups Dove molasses, 2 tablespoons salt, 2 cups suet. Grind tomatoes fine and boil in three waters, the last two warm when put on, boiling 15 minutes each time. Put ingredients together, with exception of spices, and boil 1 hour, or until apples seem done; add spices 5 minutes before removing from fire. If boiled cider is not available, pear pickle juice may be substituted. Can same as mince meat. This is an excellent substitute and preferred by some to real mince meat.

SUET PUDDING.

One cup molasses, 1 cup suet chopped fine, 1 cup sweet milk, $\frac{1}{2}$ cup chopped raisins, $\frac{1}{2}$ cup English currants, 1 teaspoon different spices to suit taste, 1 teaspoon soda, 1 teaspoon salt, $3\frac{1}{2}$ cups sifted flour. Stir ingredients together and steam 3 hours in two buttered coffee cans.

SAUCE FOR SUET PUDDING.

One cup sugar, $\frac{1}{2}$ cup butter, 1 egg, 1 lemon (all the juice and $\frac{1}{2}$ the grated peel), 1 teaspoon nutmeg, 3 tablespoons boiling water. Cook over boiling water, stirring constantly.

APPLE SAUCE CAKE.

One and one-half cups apple sauce, 2 teaspoons soda, 1 cup brown sugar, 1 cup raisins, 2 cups sifted flour, 1 teaspoon cinnamon, $\frac{1}{2}$ teaspoon cloves, a little nutmeg, $\frac{1}{2}$ cup butter, salt. Cook apples, put through a colander and sweeten as for sauce; stir soda into the apple sauce, cream butter and sugar together, stir all thoroughly, beat and bake.

MILK SOUP.

One quart sweet milk, 2 medium sized onions, sliced. Cook in double boiler for three-quarters of an hour; add 1 cup mashed potatoes, a small piece of butter, salt and pepper to taste; serve hot with butter crackers.

GRAPE JUICE.

Ten quarts grapes after stemming, 1 quart water. Let boil until the grapes are soft then mash and strain through cloth as for jelly. Do not squeeze, but let drain. Measure juice, adding scant cup of sugar to a quart of juice; let boil until sugar is all dissolved, strain and bottle while hot and seal carefully. This makes about 6 quarts. Concord make best grape juice.

FRUIT SALAD DRESSING.

Four tablespoons cream, 2 tablespoons vinegar, 3 tablespoons sugar, $\frac{1}{4}$ teaspoon mustard, $\frac{1}{4}$ teaspoon salt, 2 eggs. Beat eggs together until light, then add sugar, salt and mustard which has been mixed, next the vinegar and lastly the cream. Cook over hot water until thick, stirring constantly. Use on any fruit salad.

CHILI SAUCE.

Chop together 1 dozen good sized ripe tomatoes, 2 or 3 green peppers and 2 onions. Boil for 1 hour, then add 1 cupful vinegar, 1 tablespoon salt, 4 tablespoons light brown sugar, cinnamon and cloves to taste; boil all together for 20 minutes; seal in bottles.

MOLASSES COOKIES.

One cup lard, 1 cup sugar, 1 cup molasses, 1 cup boiling water. 1 tablespoon each of cinnamon and ginger, 1 teaspoon cloves, 1 teaspoon baking soda, a little salt, flour to make stiff enough to roll out. Bake in a quick oven, not too hot.

PICKLED CUCUMBERS.

Wash and wipe three hundred small cucumbers and one quart of peppers; put in a stone jar with $\frac{1}{2}$ cup of salt. Heat to boiling point $1\frac{1}{2}$ gallons of cider vinegar, and $1\frac{1}{2}$ pints of water. Add $\frac{1}{4}$ pound each, of whole cloves, whole allspice and stick cinnamon and 1 ounce of white mustard-seed, and pour over pickles.

WALNUT TAFFY.

Place over the fire in a kettle 3 pounds of sugar and one pint of water. When the sugar is dissolved and the syrup comes to a boil add $\frac{1}{2}$ teaspoon cream of tartar and cook to the crack degree. Spread in a buttered pan a pound and a half of shelled nuts, hickory or walnuts. Pour the boiling candy over them and when cool break into pieces.

SOAP MAKING.

NO. 1.

Take three cans of concentrated lye, 14 pounds of cracklings and rinds, 3 pails (10-quart size) of soft water. Use a large iron kettle, put in 1 pail of the water and the 3 cans of lye, let it come to a boil so as to dissolve the lye. Then put in the cracklings. Let this boil slowly for four or five hours and add, along, the two other pails of water. Before you quit boiling it put in two handfuls of powdered borax. Take away the fire from around the kettle and let it stand over night. In the morning you can cut out soap four or five inches thick and there will be no lye left in the bottom of the kettle. Cut out in cakes and lay on a board to dry; can be used in a short time.

NO. 2.

One quart soft water, 1 10-cent can Babbitt's lye, $\frac{1}{4}$ pound powdered borax. Place in kettle and heat until all is dissolved, then cool. Strain 2 quarts of grease (a part of which must be beef tallow) through a cheese cloth, pour slowly into the cold solution, mix thoroughly and stir over a fire until it becomes thick. Pour into mould before too thick and block off before thoroughly cool. This soap is too strong to use until two months old.

NO. 3.

Farmer's Soft Soap.

When cold weather sets in many farmers begin to save "soap grease" and their hard-wood ashes, preparatory to making soap in the spring. The "soap grease" consists of all kinds of scraps, such as meat rinds, bones with marrow in them, in fact all kinds of odds and ends that are partly grease. If there is no beef grease in the lot, some must be supplied.

In the spring, before the warm weather begins to affect the "soap grease," the soap is made about as follows:

Erect a board platform and trough for catching the lye. On the platform set a barrel with both ends knocked out, place in the bottom some straw and on top of this about 2 quarts of slaked lime. Fill the barrel with hard-wood ashes that have not been exposed to the weather, and pour on water one pail at a time, for several days. When the lye is strong enough to bear up an egg it is ready to use.

Place all the "soap grease" in a caldron kettle, pour on lye to cover it and boil. The lye will take up all the grease and leave the bones clean in the bottom. Boil slowly and keep trying, adding more lye or water as seems necessary, until the soap becomes thick, then let cool and place in a barrel for future use.

If perchance, as it sometimes happens, you find in the morning that the soap has "turned back," the addition of water will thicken it. Only soft water should be used in soap making.

HOW TO CURE HAMS AND BACON.

Clear, cold weather is the best for butchering time, as the meat should be cold and firm before cutting up. Trim hams and shoulders and use trimmings for sausage.

If the smoked meat is to last through the summer, it should be kept in the pickle at least six weeks; if it is to be used immediately, four weeks will be sufficient. There is nothing better than clean, dry corn cobs for smoking, although hickory chips will answer very well. All brine for pork should be strong enough to float an egg. Use enough water to cover the meat, add the ingredients of the formula used, boil, skim, let cool and pour over the meat. See that all the meat is covered.

NO. 1.

For 100 pounds of meat—1 ounce of saltpeter, 1 pint of molasses, 1 teaspoon soda, 8 pounds of salt.

NO. 2.

For 100 pounds of meat—4 tablespoons saleratus, 8 pounds of salt, 2 pounds brown sugar, 1 ounce saltpeter.

CURING HAMS AND BACON WITHOUT BRINE.

NO. 1.

For 100 pounds of meat—1 pound pepper, $\frac{1}{2}$ pound red pepper, $\frac{1}{2}$ pound powdered saltpeter, 3 pounds brown sugar, 1 bushel salt. Mix, rub each piece of meat thoroughly and pack closely in a large tub. Leave same as with brine, then wash, dry and smoke.

NO. 2.

For 100 pounds of meat—2 quarts salt, 3 ounces powdered saltpeter, 4 ounces sugar, $\frac{1}{2}$ pint molasses. Mix well and rub meat three times with the mixture, two weeks between rubbings, wash dry and smoke.

NO. 3.

For 100 pounds meat—4 pounds salt, $\frac{1}{4}$ pound powdered saltpeter, 8 tablespoons brown sugar. Mix, divide into three parts, and rub one portion into the meat every three days. Place with rind down.

PACKING PORK.

Use stone jar or whiskey barrel. Nothing but perfectly clean and freshly scalded receptacles will do. Do not use, for pork, a barrel that has been used for beef. Put salt into the bottom of the barrel or jar, pack the pork in tightly, sprinkling salt over it as it is packed. Make brine as for hams, except that only salt is used. After two weeks if the brine looks muddy or ropy, take out, boil, skim, wash the pork and return to jar. Do not put new brine on old pork.

SAUSAGE.

Sausage is made from the pork trimmings. Various seasonings are used, but sage is the staple. For the city market use less fat than for the country. Pour the seasoning over the pieces before grinding. After grinding mix thoroughly, pack into clean jars and pour melted lard over the top. If preferred, the sausage may be packed in unbleached muslin bags, dipped in grease, and hung in a dry place.

NO. 1.

For 1 pound of meat— $1\frac{1}{2}$ teaspoons salt, 1 teaspoon pepper, $1\frac{1}{2}$ teaspoons sage.

NO. 2.

For 40 pounds of meat—18 ounces salt, 2 ounces pepper, 4 ounces sage.

HEAD CHEESE.

Soak the upper parts of the heads for a day or two in water in which enough salt has been put to make a fairly strong brine. This will remove all the blood and render them white and pure. They should have been thoroughly cleaned before placing in the brine. Boil until the bones will drop easily. Let cool, then chop finely. Season to taste with pepper salt and such aromatic herbs as liked, as sage, summer savory, etc. Place in a deep earthen dish or crock and weight so as to form a firm mass. Let remain until well set. It may be served cold, cut in thin slices, or sliced and rolled in flour and fried. It makes a nice breakfast dish.

PIGS' FEET.

Thoroughly clean the feet, then boil until the bones are ready to drop out. When cold they may be put into a hot spiced vinegar.

BOLOGNA SAUSAGE.

Six pounds of lean beef, 1 pound salt pork, 3 pounds lean fresh pork, 1 pound beef suet, 1 ounce white pepper, 1 teaspoonful ground mace, 3 ounces salt, one teaspoonful cayenne, 1 large onion chopped fine. Chop the meat and suet separately very fine, then mix; add

all the seasoning, and mix thoroughly. Fill into casings and tie into lengths, or use strong linen bags. Make a brine that will bear an egg; put the sausage into it, and let stand two weeks, turning and skimming every day. At the end of the first week throw away the old brine, and put the sausage into new for the second week; then smoke for a week. When smoked rub over the outside with olive oil, and store in a cool, dark, dry place. If you wish to keep the sausage for any length of time sprinkle the outside with pepper.

PICKLING BEEF.

NO. 1.

For 100 pounds of beef, fresh killed, take twelve pounds of salt, eight pounds of brown sugar, one ounce of saltpeter, and mix thoroughly. Cut the beef in suitable pieces and pack in the barrel, using the mixture as you pack. Weight the meat down, after packing closely and tightly, and leave twenty-four hours; then cover well with cold water, and weight well to keep the meat under the brine, tipping the barrel back and forth frequently to keep the brine well stirred up. This meat will keep all summer, and when wanted for use, will need no freshening, but should be simply washed in cold water and boiled slowly until the bones will slip out. The meat must at all times be completely covered with the brine, and well weighted to keep it under.

NO. 2.

For 100 pounds of beef, dissolve 8 pounds of best salt, 4 pounds of brown sugar and 4 ounces of saltpeter in water, boil, skim and pour on boiling hot. Weight the meat down securely.

COMMISSION MERCHANTS.

While we do not guarantee the reliability of any commission merchant, we believe that those listed below will give you a square deal. Should they not do so, please notify us at once.

We advise caution in shipping to unknown firms who send out quotations higher than those of established houses. Such parties are often irresponsible, and are in the habit of pocketing the entire returns and leaving for parts unknown. Avoid them.

BALTIMORE, MD.

THOMAS BOND & SON, Fruits and Vegetables, 17 E. Camden St.
THE SNYDER & BLANKFARD CO., Fruits and Vegetables, 220-222 Light St.
STEVENS BROTHERS, Fruits and Produce, 226 Charles St.

BOSTON, MASS.

ALLEN-HURD CO., Fruits and Produce, 4 New Faneuil Hall Market.
CHAPIN BROTHERS, Fruits and Produce, 107-109 Market St.
COLLINS, PRATT & GRAVES CO., Fruits and Produce, Poultry and Eggs,
13 North Side Faneuil Hall Market.
T. E. HOLWAY & CO., Fruits and General Produce, 15 North Market St.
J. D. MEAD COMPANY, Fruits and General Produce, cor. Clinton and Fulton
Sts.
A. F. YOUNG & CO., Fruits, Onions and Potatoes, 77 Clinton St.
POTTER & WILLIAMS CO., INC., Fruits and General Produce, 144-146 Michi-
gan Ave.

BUFFALO, N. Y.

BURT H. BEAN, Fruits and Produce in car lots, W. Market and Perry Sts.
F. BRENNISEN & SON, General Commission Merchants, 156-158 Michigan Ave.
G. M. WATTLES & SON, Wholesale Butter, Eggs and Cheese, 152 Michigan Ave.
DANIEL BOOSING, Wholesale Butter, Eggs and Cheese, 154 Michigan Ave.
GEO. R. WHITNEY, Wholesale Butter Eggs, and Cheese, 42 W. Market St.

CHICAGO, ILL.

BARNETT BROS., Vegetables, Butter, Eggs and General Produce, 117 W. So.
Water St.
COYNE BROS., Vegetables, Butter, Eggs and Poultry, 119 W. So. Water St.
A. L. McCLAY & CO., Fruits and Vegetables, 131 W. So. Water St.
G. M. H. WAGNER & SONS, Fruits and Vegetables, 123 W. So. Water St.

CINCINNATI, O.

F. ANKENBAUER & SONS, Fruits and Vegetables, 118 E. Front St.
ARMACOST, RILEY & CO., Fruits and General Produce, 111-113 E. Front St.
I. J. CANNON & CO., Fruits and Vegetables, 110 E. Front St.
G. E. MARKLEY & CO., Foreign and Domestic Fruits, Vegetables, 212-214
W. Sixth St.
I. N. PIERCE & CO., Foreign and Domestic Fruits, Vegetables, 224 W. Sixth St.
HENRY RANSICK & SONS, Fruits and Produce, 226 W. Sixth St.
THE WEIL-BROCKMAN CO., Fruits and Vegetables, 107-109 E. Front St.

CLEVELAND, O.

THE BIGALOW FRUIT CO., Fruits and Produce, Cor. E. Ninth and Broadway.
H. M. STRAUSS & CO., Fruits and Produce, Hay and Grain, 933 Garfield Bldg.

COLUMBUS, O.

THE EVANS & TURNER CO., Fruits and Produce, 123 Chestnut St.
THE WILLIAM FISHER & SONS CO., Fruits & Produce, 120 E. Towne St.

DETROIT, MICH.

F. M. BALDWIN & CO., Fruits and Vegetables, 360 Jefferson Ave.
GEO. L. COLLINS & CO., Wholesale Fruits, Produce and Poultry, 29 Woodbridge St.
CHAS. BROWN & CO., Fruits and Produce, Eastern Market.
EDWARD READE & SON, Fruits, Vegetables, Beans, etc., 26 W. Woodbridge St.
J. M. SMITH & CO., Wholesale Fruits and Produce, 41 W. Woodbridge St.

INDIANAPOLIS, IND.

GEO. HITZ & CO., Foreign and Domestic Fruits and Vegetables, 30-34 S. Delaware St.
J. L. KEACH, Fruits and Produce, 112 S. Delaware St.
JOHN W. NEUMAN & CO., Fruits and Produce, 29 S. Delaware St.

KANSAS CITY, MO.

C. C. CLEMONS PRODUCE CO., Wholesale Fruits and Produce, 128 and 132 Grand Ave.
DOUGLAS-AGNEW FRUIT CO., Wholesale Fruits and Produce, 419 Walnut St.

LOUISVILLE, KY.

JOS. DENUNZIO FRUIT CO., Fruits, Vegetables and Produce, 112 W. Jefferson St.
KOHLHEPP & IULA, Fruits and General Produce, 200 E. Jefferson St.
D. B. SPERRY, Apples, Potatoes, Beans and Onions, 108-110 S. Second St.

MILWAUKEE, WIS.

A. G. EISSLER & CO., Fruits and Produce, 275 Broadway.
E. R. GODFREY & SONS CO., Fruits and Produce, 257 Broadway.
A. GROSSENACH CO., Fruits, Produce and Vegetables, 299-303 Broadway.
A. J. W. PIERCE CO., Produce, Vegetables, Eggs and General Commission, 305-307 Broadway.

MINNEAPOLIS, MINN.

GRINNELL, COLLINS CO., Green Fruits and Country Produce, 212 Sixth St., N.
C. E. HEALY & SON, Wholesale Dealers in Potatoes and Produce, 125 N. Sixth St.

NEW ORLEANS, LA.

E. P. STACY & SONS, Fruits and Produce, 200-202 Sixth St., N.
JORDAN BROS., Fruits and Produce, 206 Sixth St., N.
GEO. W. DAVIDSON & CO., Fruits and Produce, 309-313 Poydras St.
NOBLE & SALTER, Fruits and Produce, 201-215 Gravier St.

NEW YORK, N. Y.

J. H. BAHRENBURG BRO. & CO., Fruits and Produce, 103-105 Murray St.
 E. R. BRACKETT CO., Fruits and Vegetables, cor. Franklin and West Sts.
 W. J. & S. H. DAVENPORT, Fruits and Produce, 130 Park Place.
 R. W. DIXONS & SON, Fruits and Produce, 266 Washington St.
 S. H. & E. H. FROST, Fruits and Vegetables, 319 Washington St.
 FURMAN & PAGE, Fruits, Vegetables and Produce, 112 Warren St.
 HORACE B. HANSON, Fruits and Produce, 180 Reade St.
 HENRY L. HUNTER, INC., Fruits and Produce, 849 Morris Ave.
 McCORMICK, HUBBS & CO., Fruits and Produce, 279 Washington St.
 JOHN NIX & CO., Fruits and Vegetables, 281 Washington St.
 OLIVIT BROS., INC., Fruits and Vegetables, 335 Washington St.
 SIMONS, SHUTTLEWORTH & FRENCH CO., INC., Exporters and Importers
 of Green Fruits, 204 Franklin St.
 A. F. YOUNG & CO., Vegetables and Fruits, Washington and Duane Sts.

PHILADELPHIA, PA.

E. S. ARMSTRONG & CO., Fruits and Vegetables, 132 Dock St.
 BARKER & CO., Fruits and Vegetables, 226 Dock St.
 WILLIAM G. BONSTEDT, Fruits and Produce, 10 S. Front St.
 BROWN & McMAHON, Fruits and Vegetables, 334 N. Front St.
 C. W. BUTTERWORTH, Fruits and Vegetables, N.E. cor. Second and Dock Sts.
 G. G. JUSTICE CO., Fruits and Vegetables, 123 Dock St.
 W. H. MICHAEL & SON, Fruits and Vegetables, 114 Dock St.
 P. S. SCOTT CO., Fruits and Vegetables, 150 Dock St.
 H. B. WILLIAMS, INC., Fruit and Produce, 29-30 Market St.
 E. S. WOODWORD & CO., Fruits and Vegetables, 122 Dock St.

PITTSBURGH, PA.

M. O. COGGINS CO., Fruits, Vegetables and Poultry, 56 21st St.
 JAMES M. FANNING, Fruits, Produce, Eggs and Poultry, 60 21st St.
 JOSEPH FLAHERTY, Fruits and Produce, cor. Penn Ave. and 21st St.
 KOEHLER PRODUCE CO., Fruits and Produce, 18th St. and Penn Ave.
 JOHN WALLACE, Fruits, Vegetables, Butter, Eggs and Poultry, 205 21st St.

RICHMOND, VA.

S. F. PADGETT & CO., Fruits, Vegetables, Butter and Eggs, 1303 E. Cary St.

ST. LOUIS, MO.

GERBER FRUIT CO., Fruits and Produce, 804-806 N. Fourth St.
 F. W. BRACKMAN COMMISSION CO., Eggs, Poultry, Butter, Fruit, 817 N.
 Fourth St.

ST. PAUL, MINN.

AUGUST AMMON, Fruits and Produce, 67 E. Third St.
 DORE-REDPATH CO., Fruits, Vegetables and Produce, 111-115 E. Third St.
 J. W. Fillebrown & Co., Wholesale Fruits, Nuts and Vegetables, 79 E. Third St.

TOLEDO, O.

M. O. BAKER & CO., Fruits, Vegetables, Butter and Eggs, 139-141 S. Huron St.
 THE GEROE CO., Foreign and Domestic Fruits and Produce, 32-36 N. Huron St.

WASHINGTON, D. C.

E. J. ADAMS & CO., Fruits and Vegetables, 907-909 B St., N. W.
 ROBERT L. ANDERSON, Fruits and Vegetables, 919 B St., N. W.
 W. H. HARRISON, Fruits and Vegetables, 905 B St., N. W.
 KREY, PRICE & CO., Live Stock, Poultry, Eggs and Produce, 923 Louisiana
 Ave, N. W.
 J. R. SHERWOOD, 905 Louisiana Ave. N. W.

CUT-FLOWER COMMISSION MERCHANTS.**BOSTON, MASS.**

N. F. McCARTHY & CO., 84 Hawley St.
H. M. ROBINSON & CO., 15 Providence St.

BUFFALO, N. Y.

WM. F. KASTING CO., 385 Ellicott St.

CHICAGO, ILL.

CHAS. W. McKELLAR, 51 Wabash Ave.
PETER REINBERG, 51 Wabash Ave.
T. A. BUDLONG, 37-39 Randolph St.

CINCINNATI, O.

THE J. M. McCULLOUGH'S SON'S CO., 310 Walnut St.

DETROIT, MICH.

MICHIGAN CUT FLOWER EXCHANGE, 38-40 Broadway.

MINNEAPOLIS, MINN.

RICE BROTHERS, 113 N. Sixth St.

NEW YORK CITY.

NEW YORK CUT FLOWER CO., Sixth Ave. and 28th St.
HENSHAW & FRENCH, 51 W. 28th St.
M. C. FORD, 121 W. 28th St.
A. L. YOUNG & CO., 54 W. 28th St.
BAGLEY, RIEDEL & MEYER, INC., 34 W. 28th St.

PHILADELPHIA, PA.

LEO NIESSON & CO., 1209 Arch St.
THE S. S. PENNOCK-MEEHAN CO., 1808-1812 Ludlow St.

WHERE TO BUY.

A request from you to any of the firms listed below will bring their latest catalog and price-list, or you will be put in touch with their nearest dealer. While we make no guarantees, we believe that every firm listed is absolutely reliable. Should your dealings with them prove unsatisfactory, please notify us at once.

ACETYLENE LIGHT PLANTS.

THE GEM CITY ACETYLENE GENERATOR CO., Dayton, O.
UNION CARBIDE SALES CO., 42nd St. Building, New York.

ALABASTINE.

ALABASTINE CO., Grand Rapids, Mich.

ALARM CLOCKS.

WESTCLOCK, La Salle, Ill.

ALFALFA SEED.

THE WING SEED CO., Mechanicsburg, O.
A. B. LYMAN, Excelsior, Minn.
N. WERTHEIMER, Ligonier, Ind.

ALUMINUM WARE.

THE ALUMINUM COOKING UTENSILS CO., New Kensington, Pa.

APPLE BARRELS.

ROBERT GILLIES, Medina, N. Y.
BECKER BROS., 389 William St., Buffalo, N. Y.
QUAKER CITY COOPERAGE CO., Buffalo, N. Y.

AUTOMATIC FEEDERS AND WATERERS.

COLUMBIAN STEEL TANK CO., Kansas City, Mo.

AUTOMOBILES.

FORD MOTOR CO., Detroit, Mich.
OAKLAND MOTOR CAR CO., Pontiac, Mich.
HUDSON MOTOR CAR CO., Detroit, Mich.
THE WILLYS-OVERLAND CO., Toledo, O.
SAXON MOTOR CAR CO., Detroit, Mich.
HUPP MOTOR CAR CO., Detroit, Mich.
FRANKLIN AUTOMOBILE CO., Syracuse, N. Y.

AUTO TRUCKS.

CHASE MOTOR TRUCK CO., Syracuse N. Y.
ATTERBURY MOTOR CO., Buffalo, N. Y.
THE AUTOCAR CO., Ardmore, Pa.
INTERNATIONAL HARVESTER CO. OF AMERICA, Chicago, Ill.
THE AVERY CO., Peoria, Ill.

BABCOCK CREAM TESTERS.

CENTRAL SCIENTIFIC CO., Chicago, Ill.

BAGS.

BUFFALO BAG CO., Buffalo, N. Y.

BARN EQUIPMENT.

Stanchions, Litter Carriers, Bull Pens, Plans, Etc.

THE HARRIS MFG. CO., Salem, O.

JAMES BOYLE & SON, Salem, O.

HUNT, HELM, FERRIS & CO., Harvard, Ill.

JAMES MANUFACTURING CO., Fort Atchinson, Wis.

WEST BEND BARN EQUIPMENT CO., West Bend, Wis.

LOUDEN MACHINERY CO., Fairfield, Iowa.

RICHARDS-WILCOX MFG. CO., Aurora, Ill.

BASKETS.

BURLINGTON BASKET CO., Burlington, Iowa.

WEBSTER BASKET CO., Webster, N. Y.

BEEES AND BEE SUPPLIES.

DEHUHN & SONS, Hamilton, Ill.

W. T. FALCONER MFG. CO., Falconer, N. Y.

THE A. I. ROOT CO., Medina, O.

THE A. G. WOODMAN CO., Grand Rapids, Mich.

DEDANT & SON, Hamilton, Ill.

BELTING.

BICKFORD & FRANCIS BELTING CO., 35 Pearl St., Buffalo, N. Y.

BERRY BASKETS AND CRATES.

MONTGOMERY BROTHERS CO., Buffalo, N. Y.

NEW ALBANY BOX AND BASKET CO., New Albany, Ind.

BLACKSMITHS' FORGES.

BUFFALO FORGE CO., Buffalo, N. Y.

C. A. S. FORGE WORKS, Saranac, Mich.

BONE CUTTERS.

STANDARD BONE CUTTER CO., Milford, Mass.

STRATTON MFG. CO., Erie, Pa.

F. W. MANN CO., Milford, Mass.

WILSON BROS., Easton, Pa.

E. C. STURNS & CO., Syracuse, N. Y.

BUILDING MATERIAL.

GORDON-VAN TINE CO., Davenport, Ia.

HARRIS BROS., Chicago, Ill.

CHICAGO MILLWORK SUPPLY CO., Chicago, Ill.

INTERNATIONAL MILL & TIMBER CO., Bay City, Mich.

BUZZ SAWS FOR CUTTING CORD WOOD.

A. W. GRAY'S SONS, Middletown, Vt.
APPLETON MFG. CO., Batavia, Ill.
HERTZLER & ZOOK CO., Belleville, Pa.
NEW HOLLAND MACHINE CO., New Holland, Pa.
CONSOLIDATED GAS ENGINE CO., 202 Fulton St., New York.

CAMERAS.

EASTMAN KODAK CO., Rochester, N. Y.

CANOES AND BOATS.

THE W. H. MULLINS CO., Salem, Ohio.
OLD TOWN CANOE CO., Old Town, Maine.
MICHIGAN STEEL BOAT CO., Detroit, Mich.
DETROIT BOAT CO., Detroit, Mich.

CARBIDE, CALCIUM.

CALCIUM CARBIDE WORKS, Niagara Falls, N. Y.

CARPENTERS' TOOLS.

SIMMONS HARDWARE CO., New York and Philadelphia.

CARRIAGES.

ELKHART CARRIAGE & HARNESS CO., Elkhart, Ind.
CHAS. H. CHILDS & CO., Utica, N. Y.
THE OHIO CARRIAGE MFG. CO., Columbus, O.
D. T. BOHON, Harrodsburg, Ky.
STUDEBAKER, South Bend, Ind.

CAST IRON PIPE.

U. S. CAST IRON PIPE & FOUNDRY CO., New York City.

CEMENT.

THE ATLAS PORTLAND CEMENT CO., New York City.
LEHIGH PORTLAND CEMENT CO., Allentown, Pa.

CEMENT TOOLS.

SMITH & HOLTON MFG. CO., Clinton, Wis.

CHICKEN COOPS.

THE NOVELTY MFG. CO., Abington, Ill.

CHURNS.

THE NOVELTY MFG. CO., Abington, Ill.
COLUMBIAN MALL CRANE CO., Columbus, O.
DE KING MFG. CO., Chicago, Ill.
THE FAYWAY CO., 117 John St., Cincinnati, O.
THE MASON MFG. CO., Canton, O.

CIDER MILLS AND PRESSES.

THE HYDRAULIC PRESS CO., 39 Courtlandt St., New York.
THE G. J. EMERY CO., Fulton, N. Y.
E. G. MENDENHALL, Kimmundy, Ill.
BOOMER & BOSCHERT PRESS CO., Syracuse, N. Y.
A. B. FARQUHAR CO., York, Pa.
PUFFER-HUBBARD MFG. CO., Minneapolis, Minn.
HYDRAULIC PRESS CO., Mount Giliad, O.

COOKING UTENSILS.

LIFETIME ALUMINUM CO., Boston, Mass.

CORN HUSKERS.

APPLETON MFG. CO., Batavia, Ill.

CORN PLANTERS.

BELCHER & TAYLOR AGRICULTURAL TOOL CO., Chicopee Falls, Mass.

CORN TESTER.

NATIONAL SEED TESTER CO., Des Moines, Iowa.

CREAM SEPARATORS.

D. H. BURRELL & CO., Little Falls, N. Y.
THE DE LAVAL SEPARATOR CO., 165-167 Broadway, New York.
THE SHARPLESS SEPARATOR CO., West Chester, Pa.
AMERICAN SEPARATOR CO., Bainbridge N. Y.
WM. GALLOWAY CO., Waterloo, Iowa.
INTERNATIONAL HARVESTER CO., Chicago, Ill.
THE ROCK ISLAND PLOW CO., Rock Island, Ill.
ALBAUGH-DOVER CO., 2227 Marshall Blvd., Chicago, Ill.
VERMONT FARM MACHINE CO., Bellows Falls, Vt.
THE STANDARD SEPARATOR CO., Milwaukee, Wis.
RUMLEY PRODUCTS CO., INC., La Porte, Ind.
EMPIRE CREAM SEPARATOR CO., Bloomfield, N. J.

CULTIVATORS.

BATEMAN MFG. CO., Greenloch, N. J.
AMERICAN HARROW CO., Detroit, Mich.
JOHN DEER PLOW CO., Moline, Ill.
ROCK ISLAND PLOW CO., Rock Island, Ill.
S. L. ALLEN & CO., Philadelphia, Pa.

CUT CLOVER.

W. R. CURTISS CO., Ransomville, N. Y.

CUTLERY.

LANDERS, FRARY & CLARK, New Brighton, Conn.

DAIRY SUPPLIES.

R. G. WRIGHT & CO., 98 E. Eagle St., Buffalo, N. Y.

DAY-OLD CHICKS.

EMPIRE POULTRY FARM, Seward, N. Y.
CONNER'S POULTRY FARM, Angola, N. Y.
BRANFORD FARMS, Groton, Conn.
ARTHUR H. PENNY, Mattituck, N. Y.
WARD W. DASEY, Frankford, Del.
WINSOR FARM, R. F. D. No. 3, Acushnet Station, New Bedford, Mass.
MICHIGAN POULTRY FARM, Lansing, Mich.
TENACRE POULTRY FARM, Cedar Grove, Princeton, N. J.
BELLMOSS POULTRY FARM, Hudson, Mass.
SHADY HILL POULTRY FARM, Bolton, Mass.
THE KEER CHICKERY, Frenchtown, N. J.
JACOB NEIMOND, Richfield, Pa.
FERNWOOD POULTRY FARM, Salt Point, N. Y.

DEHORNING SHEARS.

JOHN W. GRAY & CO., 168 W. 23rd St., New York.
M. T. PHILLIPS, Pomeroy, Pa.

DISINFECTANTS AND LICE EXTERMINATORS.

CHEMO CO., Buffalo, N. Y.
PARK, DAVIS & CO., Detroit, Mich.

DITCHING MACHINES.

THE BUCKEYE TRACTION DITCHER CO., Findley, O.
THE JESCHKE MANUFACTURING CO., Bellevue, O.
OWENSBORO DITCHER & GRADER CO., Owensboro, Ky.
BAKER-BARROB, INC., Barron Bldg., New York City.

DOGS.**Collies.**

IMNA KENNELS, West Simsbury, Conn.
SUNNY BRAE COLLIE KENNELS, Bloomington, Ill.
NELSON'S, Grove City, Pa.
WHITE STAR KENNELS, Long Branch, N. J.
AMERICAN KENNELS, 233 Third Ave., New York City.

Great Danes.

BOHRER KENNELS, Lynbrook, Long Island.

Pointers and Setters.

THE MIDKIFF KENNELS, Dallos, Pa.

German Shepherd Dogs.

ELMVIEW KENNELS, 333 Connell Bldg., Scranton, Pa.

Fox Hounds.

FIELD'S KENNELS, Somers, Conn.

DRAIN TILE.

B. G. ABBEY, Allen's Hill, N. Y.
A. S. CHILDS, Geneva, N. Y.
JOHN J. JACKSON, Albany, N. Y.
LYTHE TILE CO., Angola, N. Y.
NATIONAL FIRE PROOFING CO., Fulton, Bldg., Pittsburgh, Pa.
WM. T. LEGGETT CO., Pittsburgh, Pa.
PECK & WOOD, E. Bethany, N. Y.
TOMPKINS BROS., 257 Broadway, New York.
THE ROBINSON CLAY PRODUCTS CO., Flatiron Bldg., New York.

ELECTRIC SUPPLIES.

WESTINGHOUSE ELECTRIC MFG. CO., East Pittsburgh, Pa.
ROBERTSON ELECTRIC CO., Buffalo, N. Y.

ENGLISH WALNUT TREES (Hardy in the North.)

DANIEL N. POMEROY, Lockport, N. Y.
J. F. JONES, Lancaster, Pa.

ENSILAGE CUTTERS.

KALAMAZOO TANK & SILO CO., Kalamazoo, Mich.
IRONWOON MFG. CO., Bellefontaine, O.
RUMLEY PRODUCTS CO., Elmira, N. Y.
JOSEPH DICK MFG. CO., Canton, O.
THE SMALLEY MFG. CO., Milwaukee, Wis.
THE SILVER MFG. CO., Salem, O.
PAPEC MACHINE CO., Shortsville, N. Y.
THE E. W. ROSS CO., Springfield, O.

EVAPORATING MACHINERY.

BOUTELL MANUFACTURING CO., 558 Lyell Ave., Rochester, N. Y.

FARM AGENCIES.

STATE BOARD OF AGRICULTURE, Dover, Del.
R. B. CHAFFIN & CO., Inc., Richmond, Va.
GREIN & CO., Pearl St., Buffalo, N. Y.
F. MAXON ESTEE, Brisbane Bldg., Buffalo, N. Y.
J. C. ELLIS, Springville, N. Y.
BALL'S FARM AGENCY, Owego, N. Y.
PILE & CO., INC., Petersburg, Va.
J. B. RICE & CO., Warren, O.
M. R. RICHARDS, Washington, D. C.

FARM GATES.

ROWE MFG. CO., Galesburg, Ill.
KITZLEMAN BROS., Muncie, Ind.
CYCLONE FENCE CO., Waukegan, Ill.

FARM TRACTORS.

BULLOCK TRACTOR CO., Chicago, Ill.
A. B. FARQUAHR CO., LTD., York, Pa.
EMERSON-BRANTINGHAM IMPLEMENT CO., Rockford, Ill.
THE HOLT MFG. CO., Peoria, Ill.
BULL TRACTOR CO., 27th and University S. E., Minneapolis, Minn.
INTERNATIONAL HARVESTER CO. OF AMERICA, Chicago, Ill.
ELECTRIC WHEEL CO., Quincy, Ill.
HUBER MFG. CO., Marion, O.

FEED IN CAR LOTS.

Cotton Seed Meal.

THE WILLIAM A. BURNETT CO., Louisville, Ky.

Alfalfa Meal.

EMPIRE STATE ALFALFA MILLS, Munnsville, N. Y.

Cotton Seed Meal, Linseed, Bran, Etc.

THE BARTLETT CO., Jackson, Mich.

Molassine Meal.

MOLASSINE COMPANY, 331 Board of Trade, Boston, Mass.

Blatchford's Calf Meal.

BLATCHFORD CALF MEAL FACTORY, Waukegan, Ill.

Chick Feed.

THE H-O COMPANY MILLS, Buffalo, N. Y.

Dairy, Poultry, Hog and Horse Feed.

INTERNATIONAL SUGAR FEED CO., Minneapolis, Minn.

Gluten Feed and Scratch Feed for Chicks.

CONTINENTAL CEREAL CO., Peoria, Ill.

Dairy Feed.

CLOVER LEAF MILLING CO., Buffalo, N. Y.

FEED COOKERS.

LEWIS MANUFACTURING CO., Courtland, N. Y.

FEED GRINDING MILLS.

THE A. W. STRAUB CO., 3709 S. Ashland Ave., Chicago, Ill.

THE LETZ MFG. CO., Crown Point, Ind.

N. H. BOWSER, South Bend, Ind.

FERTILIZERS.

COLE-MORTIMER CO., 51 Chamber St., New York City.

THE CHEMICAL LABORATORIES CO., Toronto, Can.

NITRATE AGENCIES CO., 1204 Hartford Bldg., Chicago, Ill.

THE MAPES FORMULA & PERUVIAN GUANO CO., 143 Liberty St., N. Y.

BOWKER FERTILIZER CO., Buffalo, N. Y.

VIRGINIA-CAROLINA CHEMICAL CO., Richmond, Va.

A. H. CHASE & CO., 965 William St., Buffalo, N. Y.

FIRE ARMS AND AMMUNITION.

BAKER GUN CO., Batavia, N. Y.

ITHACA GUN CO., Ithaca, N. Y.

IVER JOHNSON ARMS & CYCLE WORKS, Fitchburg, Mass.

MARLIN FIREARMS CO., New Haven, Conn.

SAVAGE ARMS CO., Utica, N. Y.

REMINGTON ARMS CO., 299 Broadway, New York.

J. STEVENS ARMS & TOOL CO., Chicopee Falls, Mass.

COLT'S PATENT FIRE ARMS CO., Hartford, Conn.

THE UNION ARMS CO., 619 Auburndale Ave., Toledo, O.

FIRELESS COOKERS.

BUFFALO FIRE EXTINGUISHER CO., 67 Carroll St., Buffalo, N. Y.

WM. CAMPBELL CO., Detroit, Mich.

FIRE EXTINGUISHERS.

BUFFALO FIRE EXTINGUISHER CO., 67 Carroll St., Buffalo, N. Y.

PYRENE MFG. CO., 1358 Broadway, N. Y.

FLASHLIGHTS.

AMERICAN EVER-READY WORKS, Long Island City, N. Y.

FRUIT PICKING BAGS.

BARKER MFG. CO., 35 Ambrose St., Rochester, N. Y.

FURS (Buyers.)

FUNSTON BROS. & CO., 119 Funston Bldg., St. Louis, Mo.

ANDERSCH BROS., Minneapolis, Minn.

DEAN B. FURST, Lock Haven, Pa.

M. J. JEWETT & SONS, Redwood, N. Y.

McMILLAN FUR & WOOL CO., Minneapolis, Minn.

WARENOFF & KLEIN, 154 W. 24th St., New York.

L. A. ROSENSTEIN FUR CO., 52 W. 28th St., New York.

DAVID BLUSTEIN & BRO., 24 E. 12th St., New York.

GASOLINE AND GAS ENGINES.

OLIN GASOLINE ENGINE CO., Terrace, Buffalo, N. Y.

WITTE IRON WORKS CO., Kansas City, Mo.

GRAY MOTOR CO., Detroit Mich.

SEAGER ENGINE WORKS, Lansing, Mich.

UNITED STATES ENGINE WORKS, 1504 Canal St., Chicago, Ill.

ELLIS ENGINE CO., Detroit, Mich.

THE THOMPSON CO., Beloit, Wis.

THE MIDDLEDITCH ENGINE CO., Detroit, Mich.

J. B. NORTON CO., Utica, N. Y.

CHARLES WILLIAM STORES, 612 Stores Bldg., New York.

OTTAWA MFG. CO., 209 King St., Ottawa, Kan.

DETROIT MOTOR CAR SUPPLY CO., Detroit, Mich.

WM. GALLOWAY CO., Waterloo, Iowa.

GLOVES.

O. C. HANSON MFG. CO., Milwaukee, Wis.

GRAIN BINS.

COLUMBIAN STEEL TANK CO., Kansas City, Mo.

GRAIN DRILLS.

HERTZLER & ZOOK CO., Belleville, Pa.

PEORIA DRILL & SEEDER CO., Peoria, Ill.

CROWN MFG. CO., Phelps, N. Y.

GRAIN SPROUTERS.

J. W. MILLER CO., Rockford, Ill.

OTIS & MOE MFG. CO., 2011 Otis Bldg., Chicago, Ill.

CLOSE-TO-NATURE CO., Colfax, Iowa.

DES MOINES INCUBATOR CO., Des Moines, Iowa.

THE SMITH SPECIALTY CO., Mansfield, O.

RELIANCE INCUBATOR CO., Freeport, Ill.

BERRY'S POULTRY FARM, Clarinda, Iowa.

GREENHOUSES.

LORD & BURNHAM CO., Irvington-on-Hudson, N. Y.

JOHN C. MININGER CO., Morbridge Bldg., New York City.

GRIND STONES.

RICHARDS, WILCOX MFG. CO., Aurora, Ill.

HARNESSES.

AMSER HARNESS MFG. CO., St. Joseph, Mo.

JOHN H. SMITH & SONS, 57 Terrace, Buffalo, N. Y.

KING HARNESS CO., Rome, N. Y.

BROWN, WHITTEN & CO., Pine Bush, N. Y.

MUTUAL CARRIAGE & HARNESS CO., East St. Louis, Ill.

H. & M. HARNESS SHOP, St. Joseph, Mo.

HARROWS OF ALL KINDS.

S. L. ALLEN CO., Philadelphia, Pa.

CUTAWAY HARROW CO., Higganum, Conn.

MONMOUTH PLOW FACTORY, Monmouth, Ill.

HOWELL-GILMORE MFG. CO., Lomax, Ill.

HAY PRESSES.

THE AUTO-FEDAN HAY PRESS CO., Kansas City, Mo.

RUMLEY PRODUCTS CO., Elmira, N. Y.

SANDWICH MANUFACTURING CO., Sandwich, Ill.

COLLINS PLOW CO., Quincy, Ill.

ANN ARBOR MACHINE CO., Ann Arbor, Mich.

ADMIRAL HAY PRESS CO., Kansas City, Mo.

HEATING SYSTEMS.

AMERICAN RADIATOR CO., Chicago, Ill.

KALAMAZOO STOVE CO., Kalamazoo, Mich.

NORTH AMERICAN CONSTRUCTION CO., Bay City, Mich.

HIDES TANNED; COATS, ROBES AND MITTENS MADE.

THE CROSBY-FRISIAN FUR CO., 571 Lyell Ave., Rochester, N. Y.

SYLVANIA TANNING CO., Sylvania, O.

HOGS.**Berkshires.**

TOMPKINS FARM, Landsdale, Pa.

J. E. WATSON, Marbledale, Conn.

ROLLING HILL FARM, E. Norwich, L. I., N. Y.

R. Y. BUCKLEY, Brod Axe, Pa.

H. C. & H. B. HARPENDING, Dundee, N. Y.

M. H. TAYLOR, West Alexander, Pa.

Chester Whites.

EUGENE T. BLACK, Scio, N. Y.

VICTOR FARMS, Bellvale, Orange Co., N. Y.

EDWARD WALTER, Eureka Stock Farm, West Chester, Pa.

O. I. C.

HENRY A. STANG, Pearl River, Rockland Co., N. Y.

VICTOR FARMS, Bellville, Orange Co., N. Y.

G. S. BENJAMIN, Portland, Mich.

THE L. B. SILVER CO., 103 Vicars Bldg., Cleveland, O.

F. B. GARNER, Cincinnati, N. Y.

Jersey Reds.

ARTHUR J. COLLINS, Moorestown, N. J.

OAKWOOD FARM, Newburg, N. Y.

HOG CHOLERA SERUM.

DIRECTOR OF YOUR EXPERIMENT STATION.

HOG TROUGHS.

OAKS & BURGER, Cattaraugus, N. Y.

COLUMBIAN STEEL TANK CO., Kansas City, Mo.

HORSE BLANKETS.

CHARLES WILLIAM STORES, 22 Stores Bldg., New York.

HORSE CLIPPING MACHINES.

CHICAGO FLEXIBLE SHAFT CO., La Salle Ave., and Ontario St., Chicago.

GILLETTE CLIPPING MACHINE CO., 114 W. 32nd St., New York.

HOSIERY AND UNDERWEAR.

CHICAGO-KENOSHA HOSIERY CO., Kenosha, Wis.

D. E. SICHER & CO., New York.

HOLEPROOF HOSIERY CO., Milwaukee, Wis.

CHALMERS KNITTING CO., Amsterdam, N. Y.

FULD & HATCH KNITTING CO., Albany, N. Y.

COOPER, WELLS & CO., St. Joseph, Mich.

McCALLUM HOSIERY CO., Northampton, Mass.

H. B. GLOVER CO., Dubuque, Iowa.

HOTBED SASH.

C. N. ROBINSON & BRO., Baltimore, Md.

HYDRAULIC RAMS.

POWER SPECIALTY CO., 111 Trinity Bldg., New York.

RIFLE ENGINE CO., 2429 Trinity Bldg., New York.

ICE TOOLS.

WM. P. PRAY, Verbank, N. Y.

WISNER MFG. CO., Greenwich St., New York.

INCUBATORS.

RELIABLE INCUBATOR AND BROODER CO., Quincy, Ill.

X-RAY INCUBATOR CO., Des Moines, Iowa.

CYPHERS INCUBATOR CO., Buffalo, N. Y.

WISCONSIN INCUBATOR CO., Racine, Wis.

PRAIRIE STATE INCUBATOR CO., Homer City, Pa.

SURE HATCH INCUBATOR CO., Fremont, Neb.

ROCKFORD INCUBATOR CO., Rockford, Ill.

RAYO INCUBATOR CO., Omaha, Neb.

WARSAW INCUBATOR CO., Warsaw, Ill.

M. M. JOHNSON CO., Clay Center, Neb.

MOLINE PRESSED STEEL CO., E. Moline, Ill.

CORNELL INCUBATOR MFG. CO., Ithaca, N. Y.

THE BUCKEYE INCUBATOR CO., Springfield, O.

BURR INCUBATOR CO., Omaha, Neb.

THE UNITED FACTORIES CO., Cleveland, O.

MAMMOTH INCUBATORS.

THE HALL MAMMOTH INCUBATOR MFG. CO., Utica, N. Y.
CANDEE INCUBATOR AND BROODER CO., Eastwood, N. Y.
CYPHERS INCUBATOR CO., Buffalo, N. Y.
NEWTON GIANT INCUBATOR CO., Harrisonburg, Va.

IRRIGATION SYSTEMS.

C. W. SKINNER, Newfield, N. J.
SKINNER IRRIGATION CO., Troy, O.

IRON CORN CRIBS AND BINS.

THE IRON CRIB AND BIN CO., Wooster, O.

LADDERS.

J. S. TILLEY, Watervliet, N. Y.
BACON & CO., Appleton, N. Y.

LAMPS.

WHITE FLAME LAMP CO., Grand Rapids, Mich. (Oil.)
THE ELECTRIC STORAGE BATTERY CO., Philadelphia, Pa. (Electric.)
UNIVERSAL BATTERY CO., 3412 S. La Salle St., Chicago, Ill. (Electric.)
HOME SUPPLY CO., Kansas City Mo. (Oil.)

LAND FOR FARM PURPOSES.**Land in the Canadian Wheat Belt.**

W. D. SCOTT, Superintendent of Immigration, Ottawa, Canada.
F. A. HARRISON, 210 N. 3rd St., Harrisburg, Pa.

U. S. Government Land.

Write to the General Land Office, Washington, D. C., for pamphlets entitled, "Suggestions to Homesteaders and Persons Desiring to Make Homestead Entries," and the last edition of "The Unappropriated Lands in the United States." It may be said, however, in this connection, that, with the exception of the land that has been reclaimed and is sold with water rights, about all the desirable government land has now been taken up.

Railroad Lands.

Many railroads have land which they are selling at a low price and on easy terms. Following are the addresses of a few of their agents:
WILBUR MCCOY, Atlantic Coast Line, Jacksonville, Fla.
JOHN SEBASTIAN, 1902 Frisco Bldg., St. Louis, Mo.
F. H. LA BAUME, Norfolk and Western Ry., Roanoke, Va.
C. L. SEAGRAVES, A. T. & S. F. Ry., 2301 Railway Exchange, Chicago, Ill.
L. H. BELLAH, General Agt., N. C. & St. L. Ry., Nashville, Tenn.

Farms in the Different States.

Many of the Eastern states have compiled lists of farms which are unoccupied or for sale. These lists may be obtained free of charge by addressing the Secretary of Agriculture of the state in which you wish to locate. Nearly every city in the West has a Board of Trade, the secretary of which will be glad to put you in touch with reputable land agents in their vicinity.

LEATHER BELTING.

BICKFORD & FRANCIS BELTING CO., Buffalo, N. Y.

LIFTING DEVICES.

CHAS. E. BENEFIEL CO., Industrial Bldg., Indianapolis, Ind.

LIGHTING COUNTRY HOUSES.

EDISON STORAGE BATTERY CO., Orange, N. J.
FAIRBANKS, MORSE CO., New York City.
AUTOMATIC ELECTRIC WASHER CO., Newton, Iowa.
FAY & BOWEN ENGINE CO., Geneva, N. Y.

LIME.

THE CARBON LIMESTONE CO., 712 Stambaugh Bldg., Youngstown, O.
THE BUFFALO FERTILIZER CO., Buffalo, N. Y.
THE CASPARIS STONE CO., Clinton Bldg., Columbus, O.
THE KELLY ISLAND LIME AND TRANSPORT CO., Cleveland, O.
ROCK CUT STONE CO., 531 Union Bldg., Syracuse, N. Y.
AMERICAN LIME & STONE CO., Tyrone, Pa.
THE AGRICULTURAL AND COMMERCIAL LIME CO., Canton, O.
NATIONAL LIME AND STONE CO., Carey, O.
EDISON PULVERIZED LIMESTONE CO., 1133 Broadway, New York.
ADAMS & DULFURD CO., Chaumont, N. Y.
H. J. BURKDORF, St. Johnsville, N. Y.
CONLEY STONE CO., Utica, N. Y.
SUGAR RIVER STONE CO., Boonville, N. Y.
WORLOCK STONE CO., Canastota, N. Y.
KELLY ISLAND LIME & TRANSPORT CO., Youngstown, O.
SECURITY CEMENT & LIME CO., Berkley, W. Va.
J. E. BAKER & CO., Bainbridge, Pa.
CARBON LIMESTONE CO., Youngstown, O.
EDISON PORTLAND CEMENT CO., Stewartsville, N. J.
GRANGERS LIME & MARBLE CO., West Stockbridge, Mass.
BESSEMER LIMESTONE CO., Youngstown, O.
CHAZY MARBLE LIME CO., Chazy, N. Y.
N. T. SMITH, Sharon Springs, N. Y.

LIMESTONE CRUSHERS.

THE JEFFREY MANUFACTURING CO., Columbus, O.
WHEELING MOULD & FOUNDRY CO., Wheeling, W. Va.
NEW HOLLAND MACHINE CO., New Holland, Pa.
PENNSYLVANIA CRUSHER CO., Pittsburgh, Pa.
UNIVERSAL CRUSHER CO., Cedar Rapids, Ia.
WILLIAMS PATENT CRUSHER & PULVERIZER CO., St. Louis, Mo.

LIME SPREADERS.

WOODSBORO LIME SPREADER CO., Baltimore, Md.
GREENWOOD MFG. CO., Lawrence, Mass.
BELCHER & TAYLOR AGRICULTURAL TOOL CO., Chicopee Falls, Mass.

LINENS.

T. D. WHITNEY & CO., Temple Pl. and West St., Boston, Mass.
PARKER, WILDER & CO., Boston and New York.

LUMBER.

HOME LUMBER & SUPPLY CO., 343 S. Dearborn St., Chicago, Ill.

MAIL ORDER HOUSES.

SEARS & ROEBUCK, Chicago, Ill.
MONTGOMERY WARD & CO., Chicago, Ill.
LINCOLN, LEONARD & CO., Chicago, Ill.
THE LARKIN CO., Buffalo, N. Y.
HARTMAN FURNITURE AND CARPET CO., Chicago, Ill.

MANURE SPREADERS.

THE WILLIAM GALLAWAY CO., Waterloo, Iowa.
THE NEW IDEA SPREADER CO., Coldwater, O.
APPLETON MFG. CO., Batavia, Ill.
INTERNATIONAL HARVESTER CO. OF AMERICA, Chicago, Ill.

MAPLE SYRUP ARCHES AND EVAPORATORS.

GRIMM MFG. CO., Cleveland, O.
McLANE AND SCHANK HARDWARE CO., Linesville, Pa.

MILKING MACHINES.

EMPIRE CREAM SEPARATOR CO., Bloomfield, N. J.
SHARPLESS SEPARATOR CO., New Castle, Pa.
HINMAN MILKING MACHINE CO., Oneida, N. Y.

MOLASSES FOR STOCK.

PITTSBURG MOLASSES CO., 706 Penn Ave., Pittsburg, Pa.
THE MOORE BROS., Albany, N. Y.

MOTORCYCLES.

HARLEY-DAVIDSON MOTOR CO., Milwaukee, Wis.
EMBLEM MFG. CO., Angola, N. Y.
HENDEE MANUFACTURING CO., Springfield, Mass.
IVER JOHNSON'S ARMS & CYCLE WORKS, Fitchburg, Mass.
THE MIAMI CYCLE & MFG. CO., Middletown, O.

NITRATE OF SODA.

DR. WILLIAM S. MYERS, 25 Madison Ave., New York City.
NITRATE AGENCIES CO., 106 Pearl St., New York City.

NURSERIES.

ELLWANGER & BARRY, Rochester, N. Y.
BROWN BROS., Rochester, N. Y.
H. S. WILEY & SON, Cayuga, N. Y.
STARK BROS., Louisiana, Mo.
MAPLE BEND NURSERY, Perry, O.
THE BARNES BROS. NURSERY CO., Yalesville, Conn.
STORES & HARRISON, Painesville, O.
NELSON BOGUE, Batavia, N. Y.
GREEN'S NURSERY CO., Rochester, N. Y.
HARRISON'S NURSERIES, Berlin, Md.

ORCHARD HEATERS.

THE RICHARDSON FROST PREVENTATION CO., Kansas City, Mo.
ORCHARD SUPPLY CO., 826 N. Fourth St., St. Louis, Mo.
THE HAMILTON ORCHARD HEATER CO., Wheeling, W. Va.

PAINTS.

O. W. INGERSOLL, 246 Plymouth St., Brooklyn, N. Y.
SEARS & ROEBUCK, Chicago, Ill.
NATIONAL LEAD & OIL CO., Pittsburg, Pa.
BLACK DIAMOND PAINT AND VARNISH WORKS, Cincinnati, O.
NEW JERSEY ZINC CO., 55 Wall St., New York City.
JOHN LUCAS & CO., Philadelphia, Pa.

PAINT FOR TREE WOUNDS.

B. C. PRATT CO., 50 Church St., New York City.

PAPER TOWELS.

SCOTT PAPER CO., 720 Glenwood Ave., Philadelphia, Pa.

PARCEL POST BOXES.

For Eggs, Day-old Chicks, Dressed Poultry, Etc.

THE HINDE & DAUCHE PAPER CO., Sandusky, O.
H. K. BRUMMER, 45 Harrison St., New York City.
THE A. W. CRAWFORD CO., INC., South Weymouth, Mass.
THE ANDREWS PAPER BOX CO., Chattanooga, Tenn.
JOHN W. GRAY & CO., 168 W. 23rd St., New York City.
TYWACANA FARMS POULTRY CO., Farmingdale, L. I., N. Y.

PERIODICALS.

The Leading Farm Papers.

THE RURAL NEW-YORKER, New York City.
COUNTRY GENTLEMAN, Philadelphia, Pa.
FARM JOURNAL, Philadelphia, Pa.
HOARD'S DAIRYMAN, Ft. Atkinson, Wis.
IOWA HOMESTEAD, Des Moines, Iowa.
NATIONAL STOCKMAN AND FARMER, Pittsburg, Pa.
NEW ENGLAND HOMESTEAD, Springfield, Mass.
OHIO FARMER, Cleveland, Ohio.

The Best Story Paper.

THE YOUTH'S COMPANION, Boston, Mass.

PHOSPHATE ROCK.

FEDERAL CHEMICAL CO., Columbia, Tenn.
ROBIN JONES PHOSPHATE CO., Nashville, Tenn.

PIANOS.

IVERS & POND PIANO CO., 131 Boylston St., Boston, Mass.
REED & SONS, Jackson Blvd. and Wabash Ave., Chicago, Ill.
J. B. THIERY, Milwaukee, Wis.
WING & SON, New York City.
CORNISH CO., Washington, N. J.

PLOWS.

GOWANDA PLOW CO., Gowanda, N. Y.
JOHN DEER CO., Syracuse, N. Y.
HAPGOOD PLOW CO., Alton, Ill.

PORTABLE POULTRY HOUSES.

PERFECTION PORTABLE POULTRY HOUSE CO., 4038 N. Cal. Ave., Chicago
E. F. HODGSON CO., 116 Washington St., Boston, Mass.
THE MILLER MFG. CO., 8001 Alabama St., St. Louis, Mo.
T. F. POTTER & CO., Downers Grove, Ill.

POTASH FOR FERTILIZERS.

GEARAN KALI WORKS, Inc., 42 Broadway, New York.

POTATO PLANTERS AND DIGGERS.

CHAMPION POTATO MACHINERY CO., Hammond, Ind.
BATEMON MFG. CO., Greenloch, N. J.
EUREKA MOWER CO., Utica, N. Y.
S. L. ALLEN & CO., Philadelphia, Pa.
ASPINWALL MFG. CO., Jackson, Mich.

POULTRY, EGGS FOR HATCHING AND DAY-OLD CHICKS.

CONNER'S POULTRY FARM, Angola, N. Y.
THE RANOCAS POULTRY FARM, Brown's Mills-In-The-Pines, N. J.
THE CORNING EGG FARM, Bound Brook, N. J.
BRANFORD FARMS, Groton, Conn.
G. F. GIBSON, Clyde, N. Y.
SUNNY MEAD FARMS, Millstone, N. J.
ARTHUR H. PENNY, Mattituck, N. Y.
THE EVERLAY FARM, Methuen, Mass.
MOHEGAN FARM POULTRY PLANT, Mohegan Lake, N. Y.
JOHN H. WARFEL & SON, Rohrerston, Pa.
SUMMIT POULTRY FARM, Ridgely, Md.
S. L. PARDIE, Genoa, N. Y.
LAURELTON FARMS, Lakewood, N. J.
C. W. TURNER, West Hartford, Conn.

POULTRY FOUNTAINS.

THE CYPHERS INCUBATOR CO., Buffalo, N. Y.
OTIS & MOE MFG. CO., 2001 Otis Bldg., Chicago, Ill.
C. A. S. FORGE WORKS, Saranac, Mich.
WENDELL INCUBATOR CO., Holly, Mich.
IDEAL CAN CO., 147 N. Washington St., Boston, Mass.
PAGE POULTRY SUPPLY CO., Rockford, Ill.
THE OAKS MFG. CO., Tipton, Ind.

POULTRY LITTER.

O. K. COMPANY, 157 Water St., New York City.

POULTRY PAPERS.

AMERICAN POULTRY JOURNAL, 542 S. Dearborn St., Chicago, Ill.
WESTERN POULTRY JOURNAL, Cedar Rapids, Ia.
AMERICAN POULTRY ADVOCATE, Syracuse, N. Y.

POWER PUMPS OF LARGE CAPACITY.

SNOW STEAM PUMP WORKS, Buffalo, N. Y.

PUMPS.

THE GOULD MFG. CO., Seneca Falls, N. Y.
F. E. MYERS & BRO., Ashland, Ohio.
TEMPLE PUMP CO., 109 Meager St., Chicago, Ill.

RASPBERRIES.

WM. ALLEN, Salisbury, Md.
WILLETT & WHEELOCK, N. Collins, N. Y.
L. J. FARMER, Pulaski, N. Y.
JOSEPH H. BLACK, SON & CO., Hightstown, N. J.
T. B. WEST, Perry, O.

REFRIGERATORS.

MONROE REFRIGERATOR CO., Lockland, Ohio.
McCRA Y REFRIGERATOR CO., Kendallville, Ind.
SEARS & ROEBUCK, Chicago, Ill.

ROAD MACHINERY.

OWENSBORO DITCHER & GRADER CO., INC., Owensboro, Ky.
GLIDE ROAD MACHINE CO., Minneapolis, Minn.

ROOFING MATERIALS.

THE UNITED FACTORIES CO., Cleveland, O.
THE EDWARDS MFG. CO., Cincinnati, O.
H. W. JOHNS-MANVILLE CO., Chicago, Ill.
BIRD & SON, East Walpole, Mass.
W. L. McCARRON & CO., 286 Dickey Bldg., Chicago, Ill.
THE OHIO GALVANIZING & MFG. CO., Niles, O.
AMERICAN SHEET & TIN PLATE CO., Pittsburg, Pa.
THE AMERICAN IRON ROOFING CO., Middleton, O.
SYKES METAL LATH & ROOFING CO., Warren, O.
AMERICAN ROLLING MILL CO., Middleton, O.

RUBBER BOOTS.

UNITED STATES RUBBER CO., New York City.

SAW MILLS.

A. B. FARQUHAR CO., LTD., York, Pa.
AMERICAN SAW MILL MACHINERY CO., Hacketstown, N. J.
ENTERPRISE MFG. CO., Columbus, Ohio.

SCALES, FARM.

JONES OF BINGHAMTON, Binghamton, N. Y.
THE BUFFALO SCALE CO., Buffalo, N. Y.
FAIRBANKS COMPANY, New York City.
AMERICAN SCALE CO., Kansas City, Mo.

SEEDS OF ALL KINDS.

PETER HENDERSON & CO., New York City.
WILLIAM MAULE, Philadelphia, Pa.
HENRY DREER, Philadelphia, Pa.
SALZER SEED CO., La Crosse, Wis.
THE STORRS & HARRISON CO., Painesville, Ohio.
W. ATLEE BURPEE & CO., Philadelphia, Pa.
EDWARD F. DIBBLE, Hoyeoye Falls, N. Y.
J. J. H. GREGORY & SONS, Marblehead, Mass.

SHEEP MANURE, PULVERIZED.

NATURAL GUANO CO., Aurora, Ill.

SHINGLE DIPS AND STAINS.

STANDARD STAINED SHINGLE CO., N. Tonawanda, N. Y.
SAMUEL CABOT, INC., 8 Oliver St., Boston, Mass.

SHIPPING COOPS.

THE SEFTON MFG. CO., 1329 W. 35th St., Chicago, Ill.

SHOW COOPS.

NIEMANN BROS. MFG. CO., Mt. Olive, Ill.
WARNER, "THE COOPMAN," Allegan, Mich.

SILOS.

INDIANA SILO CO., Anderson, Ind.
GUERNSEY CLAY CO., Odd Fellows' Bldg., Indianapolis, Ind.
FARMERS' HANDY WAGON CO., Saginaw, Mich.
CREAMERY PACKAGE CO., Rutland, Vt.
E. W. ROSS CO., Springfield, O.
THE NAPPANEE LUMBER & MFG. CO., Nappanee, Ind.
ECONOMY SILO MFG. CO., Frederick, Md.
INTERNATIONAL SILO CO., Linesville, O.
THE STEVENS TANK & TOWER CO., Auburn, Me.
THE PUFFER-HUBBARD MFG. CO., Des Moines, Ia.
UNADILLA MFG. CO., Unadilla, N. Y.
THE W. L. SCOTT LUMBER CO., Norwich, N. Y.
HARDER MFG. CO., Cobleskill, N. Y.
NATIONAL FIRE PROOFING CO., Syracuse, N. Y.
WOODS SILO & MFG. CO., Lincoln, Neb.
INTERNATIONAL SILO CO., Linesville, Pa.

SILVERWARE.

INTERNATIONAL SILVER CO., Meriden, Conn.
ONEIDA COMMUNITY, LTD., Oneida, N. Y.
THE HOLMES & EDWARDS SILVER CO., Bridgeport, Conn.

SPRAYING MACHINES (POWER).

AIR-TIGHT STEEL TANK CO., 30 Gloster St., Philadelphia, Pa.
BATEMAN MFG. CO., Greenloch, N. J.
BEAN SPRAY PUMP CO., Lansing Mich.
BENNETT SPRAYER & ENGINE CO., Medina, O.
THE E. C. BROWN CO., Rochester, N. Y.
CUSHMAN SPRAYER CO., St. Joseph, Mo.
THE DEMING CO., Salem, O.
DEYO-MACEY ENGINE CO., Binghamton, N. Y.
DOMESTIC ENGINE & PUMP CO., Shippensburg, Pa.
FIELD FORCE PUMP CO., Elmira, N. Y.
FRIEND MFG. CO., Gasport, N. Y.
THE GOULDS MFG. CO., Seneca Falls, N. Y.
THE HARDIE MFG. CO., Hudson, Mich.
HAYES PUMP & PLANTER CO., Galva, Ill.
THE H. L. HURST CO., Canton, O.
LE ROY PLOW CO., LeRoy, N. Y.
MORRILL & MORLEY MFG. CO., Benton Harbor, Mich.
E. E. MYERS & SON, Ashland, O.
ROCHESTER SPRAY PUMP CO., Rochester, N. Y.
THE STAHL SPRAYER CO., Quincy, Ill.
SPRAY MOTOR WORKS, 326 Erie St., Buffalo, N. Y.

SPRAY MATERIAL, MANUFACTURERS AND WHOLESALERS.

ANSBACKER & CO., 253 Broadway, New York City.
APHINE MFG. CO., Madison, N. J. (Aphine).
BOWKER INSECTICIDE CO., 43 Chatham St., Boston, Mass.
THE DOW CHEMICAL CO., Midland, Mich.
FERGUSON BROS., 109 Chestnut St., Philadelphia, Pa. (Copper Sulphate).
GOOD, JAMES, 934-941 N. Front St., Phila., Pa. (Fish Oil Soap).
GRASELLI CHEMICAL CO., Cleveland, Ohio.
HEMINWAY'S LONDON PURPLE CO., 133 Front St., New York City.
HORTICULTURAL CHEMICAL CO., 12th and Chestnut Sts., Philadelphia, Pa.
KENTUCKY TOBACCO PRODUCT CO., Louisville, Ky.
FRED L. LAVANBURG, 100 William St., New York City.
MECHLING BROS. MFG. CO., Camden, N. J.
MERRIMAC CHEMICAL CO., 33 Broad St., Boston, Mass.
NIAGARA SPRAYING CO., Middleport, N. Y.
PRATT & CO., B. G., 50 Church St., New York City
SHERWIN WILLIAMS PAINT CO., Cleveland, Ohio.
TAYLOR, E. R., Penn Yan, N. Y. (Fuma Carbon Bi-sulphid).
THOMSON CHEMICAL CO., Baltimore, Md.
THUM, O. & W. CO., Grand Rapids, Mich. (Sticky materials for tree banding).
TYSON, E. C., Floradale, Pa. (General Sales Agent for Spray Materials).
VREELAND CHEMICAL CO., 50 Church St., New York City.

STANCHIONS.

C. H. ROBERTSON, Forestville, Conn.
FOSTER STEEL STANCHION CO., Rochester, N. Y.
THE WASSON STANCHION CO., Cuba, N. Y.
WALLACE R. CRUMB, Forestville, Conn.
WARSAW-WILKINSON CO., Warsaw, N. Y.
LOUDEN MACHINERY CO., Fairfield, Iowa.
HUNT-HELM-FERRIS CO., Harvard, Ill.
J. E. PORTER CO., Ottawa, Ill.
HARRIS MFG. CO., Salem, O.

STONE CRUSHERS.

AUSTIN MANUFACTURING CO., Chicago, Ill.
ALLIS CHALMERS MFG. CO., Milwaukee, Wis.
T. L. SMITH CO., 1126-C, 32nd St., Milwaukee, Wis.
NEW HOLLAND MACHINE CO., New Holland, Pa.

STOVES.

HOOSIER STOVE CO., Marion, Ind.
THE IMPERIAL STEEL RANGE CO., Cleveland, O.
KALAMAZOO STOVE CO., Kalamazoo, Mich.
MALLEABLE IRON CO., Beaver Dam, Wis.
MAJESTIC MFG. CO., St. Louis, Mo.
MARVIN SMITH & CO., Chicago, Ill.
GOLD COIN STOVE CO., Troy, N. Y.
MICHIGAN STOVE CO., Detroit, Mich.

STRAWBERRY PLANTS.

R. M. KELLOGG & CO., Three Rivers, Mich.
WILLETT & WHEELOCK, North Collins, N. Y.
WM. ALLEN, Salisbury, Md.
JACOB BUZENBURG, Brant, N. Y.
ALLEN BROS., Paw Paw, Mich.
J. W. ALLEN & SON, Allen, Md.
C. S. KEMPTON, Longmeadow, Mass.

STUMP PULLERS.

ZIMMERMAN STEEL CO., Lone Tree, Ia.
HERCULES MFG. CO., Centerville, Ia.
MILNE MFG. CO., Monmouth, Ill.
W. J. FITZPATRICK, Seattle, Wash.

TANKS.

A. J. CORCORAN, Inc., 192 Broadway, New York.

TANK HEATERS.

NELSON MFG. CO., Deerfield, Wis.

TANNERS.

LOGANSPOUT ROPE & TANNERY CO., Logansport, Ind.
THE PELOQUIN FUR TANNING CO., Rochester, N. Y.
SYLVANIA TANNING CO., Sylvania, O.
NATIONAL TANNING CO., Des Moines, Ia.

TELEPHONES.

STROMBERG CARLSON TEL. MFG. CO., Rochester, N. Y.

TENTS AND CANVAS HOUSES.

CLOSE-TO-NATURE CO., 374 Front St., Colfax, Iowa.
HETTRICK BROS. CO., Toledo, Ohio.

THRESHING MACHINES.

BUFFALO PITTS CO., Buffalo, N. Y.
INTERNATIONAL HARVESTER CO., Chicago, Ill.
A. B. FARQUAHR CO., Chicago, Ill.

TREE BANDS.

THE O. & W. THUM CO., Grand Rapids, Mich.

TURKEYS.

VALLEY VIEW POULTRY FARM, Belleville, Pa.
S. DURIG & SON, Armstrongs Mills, Ohio.
MISS JOSEPHINE CARPENTER, Grouvenir, N. Y.
H. J. VAN DYKE, Gettysburg, Pa.
H. D. WITHROW, Dublin, Va.
H. W. ANDERSON, Stewartstown, Pa.
W. L. BURNETT, Montgomery, N. Y.

VACUUM CLEANERS.

ANCHOR MFG. CO., Dayton, O.
DUNTLEY MFG. CO., 650 Main St., Buffalo, N. Y.

VARNISH.

CENTURY VARNISH CO., Buffalo, N. Y.
PRATT & LAMBERT, INC., Buffalo, N. Y.

WAGONS.

ELECTRIC WHEEL CO., Quincy, Ill.
STUDEBAKER, South Bend, Ind.
HAVANA METAL WHEEL CO., Havana, Ill.

WAGON SPRINGS.

HARVEY SPRING CO., Racine, Wis.

WASHING MACHINES, POWER.

LEADER IRON WORKS, Owego, N. Y.

KALAMAZOO MFG. CO., Kalamazoo, Mich.

THE MEADOWS MFG. CO., Pontiac, Ill. (Electric).

WESTERN ELECTRIC CO., 423 West St., New York (Electric).

DODGE & ZUILL, Syracuse, N. Y.

WATER SYSTEMS.

MILWAUKEE AIR POWER CO., Milwaukee, Wis.

FAIRBANKS, MORSE & CO., New York City.

LEADER IRON WORKS, Owego, N. Y.

MISSOURI WATER & STEAM SUPPLY CO., St. Joseph, Mo.

GOULDS MFG. CO., Seneca Falls, N. Y.

NORTH AMERICAN CONSTRUCTION CO., Bay City, Mich.

KEWANEE WATER SUPPLY CO., Kewanee, Ill.

POWER SPECIALTY CO., Trinity Bldg., New York.

WATER TOWERS.

THE BALTIMORE CO., Baltimore, Md.

WATER WHEELS.

THE FITZ WATER WHEEL CO., Hanover, Pa.

WELL DRILLING MACHINERY.

WILLIAMS BROS., Ithaca, N. Y.

LOOMIS MFG. CO., Tiffin, O.

KEYSTONE WATER DRILL CO., Beaver Falls, Pa.

LISLE MFG. CO., Clarinda, Ia.

GUSPEACH FOUNDRY & MACHINERY CO., La Mars, Ia.

WHITE LEAD.

NATIONAL LEAD CO., New York City.

ACME WHITE LEAD & COLOR WORKS, Detroit, Mich.

WIND MILLS.

AREOMOTOR CO., Chicago, Ill.

MISSOURI WATER & STEAM SUPPLY CO., St. Joseph, Mo.

STOVER MFG. CO., Freeport, Ill.

WIRE FENCING.

KITSELMAN BROS., Muncie, Ind.

UP-TO-DATE MFG. CO., Terre Haute, Ind.

INTERLOCKING FENCE CO., Morton, Ill.

COILED SPRING FENCE CO., Winchester, Ind.

THE BROWN FENCE & WIRE CO., Cleveland, O.

WARD FENCE CO., Decatur, Ill.

PEERLESS WIRE FENCE CO., Adrian, Mich.

AMERICAN STEEL & WIRE CO., Chicago, Ill.

THE BOND STEEL POST CO., Adrian, Mich.

CYCLONE FENCE CO., Waukegan, Ill.

THE MASON FENCE CO., Leesburg, O.

GLOSSARY.

Acid—A sour substance that will turn blue litmus paper red.

Alkali—A caustic substance that will neutralize acids and turn red litmus paper blue; as lye.

Ammonia—A gaseous nitrogen compound which escapes when substances containing it decay.

Available Plant Food—Substances that can be used as food by plants.

Bacteria—Minute vegetable organisms found in the soil and elsewhere.

Balanced Ration—A food containing the proper proportions of protein, carbohydrates and fat.

Biennial—A plant that lives two years and then dies.

Blight—A diseased condition of plants often due to bacteria.

Bordeaux Mixture—A water solution of lime and copper sulphate used to destroy fungi.

Bud—An undeveloped branch.

Calcium—An element, the chief constituent of lime.

Calcium Carbonate—Native limestone.

Carbohydrates—Foods containing carbon, hydrogen and oxygen. The last two in the proportion to form water; as sugars and starch.

Carbonic Acid Gas—A gas composed of carbon and oxygen. It is breathed out by animals and breathed in by plants.

Carbon—An element; charcoal is nearly pure carbon.

Catch Crop—A crop planted late in the season to take the place of some other crop that is a failure, or when the farmer finds that he will not have enough fodder for his stock. Millet is one of the principal catch crops.

Compost—A rotting mixture of different fertilizing materials.

Concentrates—Rich feeding materials; as grains and meals.

Cover Crop—A crop sown to furnish a mulch or green manure; as buckwheat in an orchard, or rye sown in the fall to plow under in the spring.

Cocoon—A case made by an insect in which to pass the pupa state.

Curculio—A kind of beetle or weevil.

Dormant—Not growing; as trees in winter.

Element—One of the elementary substances which make up the earth's crust.

Ensilage—The feed that is preserved in a silo.

Evaporate—Changing to a vapor and passing off in the air.

- Fermentation*—The change produced by yeast.
- Fertile*—Being fruitful; yielding good crops.
- Formalin*—A forty per cent solution of formaldehyde.
- Fungicide*—A substance that will kill or check the growth of fungi.
- Fungus* (*plural fungi*)—A flowerless plant lacking the green color. They are often microscopic and cause the moulds and blights.
- Germs*—Microscopic organisms which cause disease, fermentation, decay, etc.
- Germinate*—To sprout.
- Gestation*—Period of carrying the unborn young.
- Girdle*—To cut a groove around the trunk or limb of a tree.
- Gluten*—A vegetable form of protein found in cereals.
- Grade Cattle*—A cross between a pure-bred animal and one of the common or mixed breed.
- Heredity*—The resemblance of offspring to parent.
- Hibernating*—To pass the winter in a dormant, inactive state.
- Humus*—Decaying vegetable or animal matter.
- Hybrid*—The result of breeding two different kinds of plants or animals together.
- Hydrogen*—One of the elements; found in water and in all living things.
- Incubate*—To hatch by any means.
- Inoculate*—To supply bacteria.
- Insecticide*—A substance to destroy insects.
- Kainit*—A salt containing potash salt, mined in Stassfurt, Germany.
- Kerosene Emulsion*—A spraying solution consisting of kerosene oil, soap and water.
- Lactic Acid*—The acid formed when milk sours.
- Larva*—Young insects in the grub stage.
- Legumes*—Plants belonging to the clover family; as alfalfa, clover, peas, soy beans, etc.
- Loam*—Soil containing considerable organic matter.
- Mildew*—A cobweblike growth of fungi on plants or decaying matter.
- Mulch*—A light covering of leaves, straw, fine dust, or other substances.
- Nitrate*—A salt containing nitrogen; all nitrates are soluble.
- Nitrogen*—An element; it forms nearly four-fifths of the air; is essential to plant and animal life.
- Nodules*—Small bunches or masses formed by bacteria.
- Nutrient*—A food substance.

Organic Matter—Substance produced by life either animal or vegetable.

Osmosis—The interchange of gases or liquids through thin animal membranes.

Oxidation—Combining with oxygen.

Oxygen—A gaseous element present in the air and necessary to sustain life.

Perennials—Plants living from year to year; as trees.

Phosphoric Acid—A phosphorus compound found in bones and in some rocks.

Potash—A potassium compound necessary for plant growth.

Propagate—To increase in numbers.

Protein—Food substances that contain nitrogen.

Pure Bred—Animals with marked characteristics bred for many generations without introducing other blood.

Ration—The daily allowance of food for an animal.

Rotation of Crops—A succession of different crops on the same field.

Roughage—Coarse feed; such as hay, straw, or cornstalks.

Scion—A shoot, sprout, or branch used in grafting upon another plant.

Seed Bed—The earth in which the seed is sown.

Silage—Food preserved in a silo.

Sire—Father.

Smut—A fungus disease of plants causing a powdery mass.

Spores—The microscopic seeds of fungus plants; they differ from true seeds in having no embryo.

Sport or Mutation—An unusual fruit or plant; as, a white squash on a Hubbard vine. They are one of the sources of new varieties.

Sterilize—To kill all germs.

Stover—Cornstalks with the ears taken off.

Tillage—Preparing the land for crops.

Transplant—To move plants from one soil to another.

Ventilate—To supply fresh air.

INDEX.

	Page
Advantages and Disadvantages of Farm Life.....	7
Alfalfa	29
Bees and Bee-Keeping.....	59
Buckwheat	45
Buying a Farm.....	9
Calves	111
Cement and Concrete.....	80
Commission Merchants	164
Corn	39
Cornell Poultry Rations.....	91
Cow Troubles and Their Remedies.....	193
Currants	53
Drainage	14
Farmers' Bulletins	133
Feeding Dairy Cattle.....	115
Fertilizers	17
Flowers	57
Forestry	76
Fungicides and Insecticides.....	148
General "Don'ts" for Farmers.....	130
Glossary	188
Government Labor Bureaus.....	128
Grain Rations for Milk Production.....	123
Hay Crop, The.....	45
How to Remove Stains.....	153
Identification of Fruit.....	137
Improving the Farm Without Commercial Fertilizers or Barnyard Manure	23
Lime	25
Live Stock Registry Associations.....	137
Manures	21
Maple Sugar Making.....	87
Market Gardening	54
Method for Balancing a Ration for Dairy Cows.....	117
Milk	196
Oats	43
Orchard, The	65
Pasture, The	74
Pertinent Questions for Farmers' Wives.....	83
Potatoes	33
Poultry Troubles and Their Remedies.....	96
Profitable Dairying	100
Profitable Hog Raising.....	125
Profitable Poultry Raising.....	89
Raspberries	51
Silos and Silage.....	120
State Experiment Stations.....	132
Strawberry Culture	47
Tables, I-X	139
Tested Recipes	154
Useful Formulas	151
Weeds	70
Wheat	44
Where to Buy.....	168
Where to Go for Advice.....	132

LIBRARY OF CONGRESS



00025862223

